# THE STORY OF THE SEA AND SEASHORE

W. P. WESTELL

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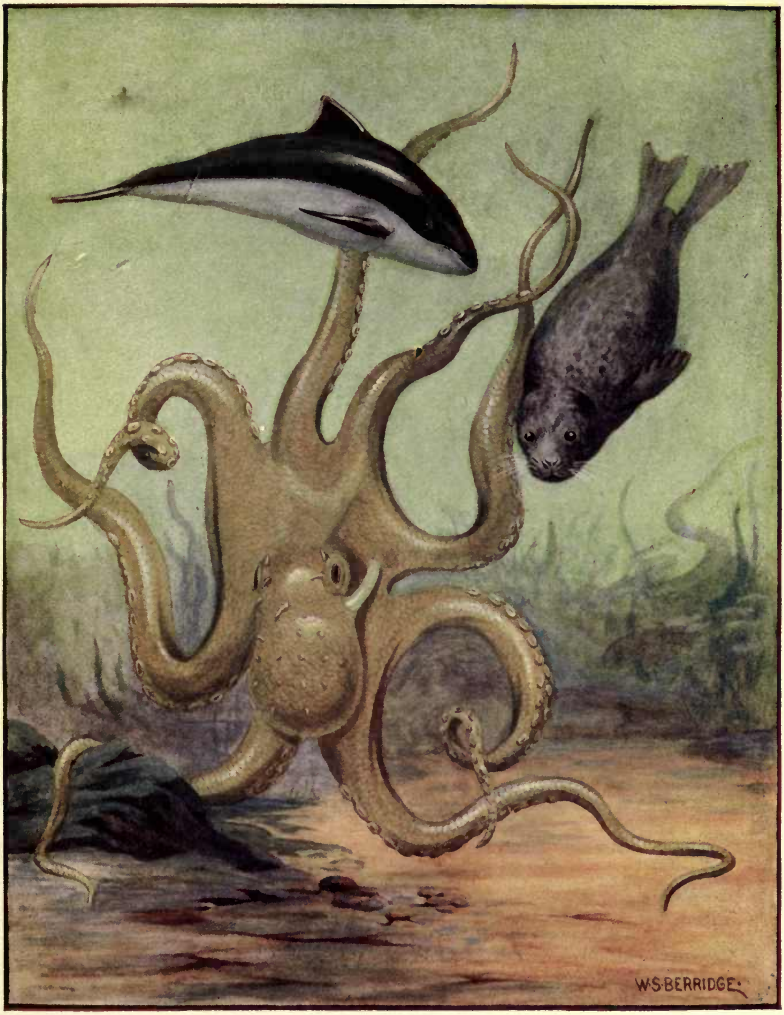
PLATE I.




1. PORPOISE. 2. SEAL. 3. OCTOPUS.

*Frontispiece.*

# THE STORY OF THE SEA AND SEASHORE

BY

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of the Selborne Society; Author of 'The Story of Insect Life,'
'A Year with Nature,' 'Country Rambles,' 'British Bird
Life,' 'Every Boy's Book of British Natural History,'
'Fifty-two Nature Rambles,' &c.

With 128 Illustrations from Photographs and Drawings (the latter mostly by C. F. NEWALL) and Eight Coloured Plates (seven by W. S. BERRIDGE, F.Z.S., and one by C. F. NEWALL)

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TO

MY FATHER

I AFFECTIONATELY

DEDICATE

THIS BOOK

M377135

# PREFACE

THE very kind reception accorded both by the public and the Press to my *Story of Insect Life*—included in the same series as the present volume—has encouraged me to prepare a further work devoted to the animal and vegetable life of the Sea and Seashore. I have endeavoured to deal in a bright, entertaining, and accurate manner with the creatures whose absorbing biographies are here under consideration, and have dealt for the most part with the commoner kinds of our British sea-folk. It is hoped that by the accounts of the lives of the animals and plants herein recorded many young people will be led to observe and inquire for themselves, for it is only by this means that any real pleasure and success can be achieved in Natural History study. I am greatly indebted, as popular works of reference, to Miss Newbiggin's *Life by the Seashore*, to which I direct the attention of all students of marine zoology; to the Rev. Theodore Wood's *The Seashore told to the Children*; to Mr. E. W. Wade's *The Birds of Bempton Cliffs*; to Mr. Frank T. Bullen's fascinating

*Creatures of the Sea* ; and to the pages of *The Zoologist*. For permission to reproduce photographs I wish to acknowledge my indebtedness to Messrs. W. Bagshaw, Stanley Crook, W. J. Clarke, B. Hanley, R. B. Imisson, C. F. Newall, F. C. Snell, Sydney H. Smith, and H. W. Shepheard-Walwyn, M.A.

To the artists, Messrs. W. S. Berridge, F.Z.S., and C. F. Newall, a word of thanks is due for their careful delineations of animal and vegetable life; and, lastly, but by no means least, to the Nature-loving public for their support, and to the Press for their kindly consideration of my past efforts, I am deeply grateful.

W. PERCIVAL WESTELL.

St. Albans, Herts,
*Summer*, 1908.

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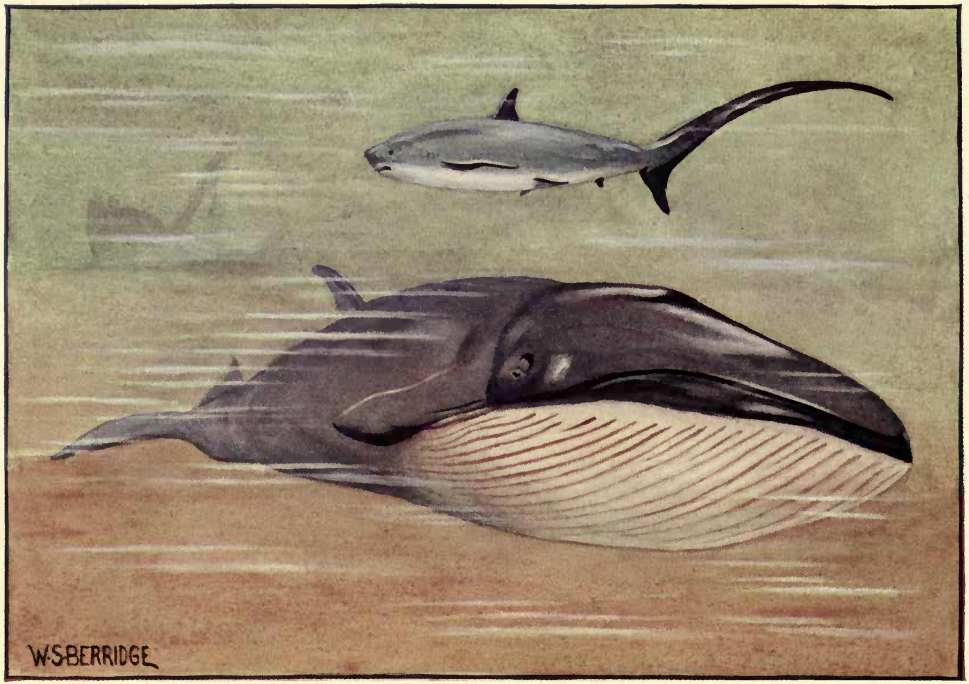



1. Thresher Shark (*Alopias vulpes*). 2. Northern Rorqual Whale (*Balaenoptera borealis*).

p. 17.

# THE STORY OF THE SEA AND SEASHORE

## CHAPTER I

### SEA MONSTERS

**(Whales, Sharks, Dog-Fishes, and the Octopus)**

It is particularly appropriate that Whales should be accorded pride of place in this opening chapter, if for no other reasons, because of the misunderstanding that exists regarding these monsters of the deep and the valuable products that are obtained from them.

Most people express keen surprise when informed that whales are not fish, but claim kinship with the Mammalia, or Mammals. Mammals are animals that suckle their young, and are warm-blooded. Fish, as is well known, mostly lay eggs, or ova, with a few exceptions, and take no heed of them when deposited. Some fish, however, such as the porbeagle, tope, and others, bring forth their young alive. Whales, being mammals, do not lay eggs, but produce their young in a living condition, and suckle them much after the

manner of a human being. Indeed, as we ourselves are placed right at the head of the Mammalia, it will at once be recognized (though possibly with surprise) that these huge sea monsters are not distantly related to you and me.

The British Mammalia are divided into a number of orders, commencing with the Bats (order *Chiroptera*) and ending with the Whales and Porpoises (order *Cetacea*). Between these two orders—the first and last on the list of our own Mammalian fauna—there comes the order *Insectivora*, containing the Hedgehog, Mole, &c.; the order *Carnivora*, containing the Wild Cat, Fox, Stoat, Weasel, &c.; the order *Rodentia*, containing the Squirrel, Dormouse, Rat, Mouse, Vole, Hare, Rabbit, &c.; and the order *Ungulata*, containing the Deer.

Whales, then, are warm-blooded animals, which inhabit the ocean's depths; they breathe by means of lungs, and do not possess gills like a fish; and they bring forth and rear their young in a similar manner to other mammals. The Right, or Whalebone, whale may with advantage claim first mention here for the reason that this large creature does not possess any teeth, and belongs to the toothless kinds who feed upon shoals of minute crustaceans. These latter, mere atoms of life, congregate in vast quantities, and it must be an engaging sight to witness one of these

huge monsters feeding. The whale takes in a mouthful of the food, and, this accomplished, it expels water from its mouth, whereupon that portion of the matter which is not of service to it is left stranded upon what are known as the plates of baleen, or 'whalebone.'

This dietary is not partaken of by whales possessing teeth, for their food consists of various kinds of fish. They are voracious feeders, and swallow their prey whole, a habit which results in the valuable production of ambergris, as Mr. Aflalo points out in his indispensable volume devoted to our British vertebrate animals. This will be more fully explained later. The Right whale is black in colour on the upper surface and lighter below. It measures about fifty feet in length, and possesses a large flat head. The 'whalebone' is situate in the upper jaw of the monster, and is made up of something like six hundred plates.

We may briefly consider, before proceeding further, what useful products we obtain from whales, their methods of breeding, and general structure and characteristics. After that we can point out the salient features of the few other species which inhabit the seas that encompass our island home, or which on occasions become stranded upon our shores.

Four important and useful products are obtained. First comes the indispensable 'whalebone,' which is so largely used in the manufacture of ladies' corsets

and other articles. This product is very valuable indeed as an article of commerce, and has realized over £2,000 per ton. From the Cachalot, or Sperm-whale, we obtain what is known as spermaceti. The fluid is secreted in a receptacle situate in the Cachalot's forehead. When cooled down this fluid becomes hardened, and after being scientifically treated, is largely used in the preparation of various kinds of ointments. One whale alone yields sufficient spermaceti to fill several barrels, that is if the monster be of a good size.

In the production of ambergris quite an uncanny story has to be told. I have already pointed out the voracious appetites that whales possess, and how those species possessing teeth bolt their food whole. Among the creatures so devoured the cuttlefish is much beloved, and as these latter are found in vast quantities, the toothed whales have a plentiful banquet awaiting them. Now, this cuttlefish has a beak, and one can well imagine how the giant cetacean courts indigestion by swallowing a number of these creatures without tearing them to pieces and casting away the indigestible portions. But the whale is no respecter of persons, and does not stop at trifles. Our feathered friend the owl is somewhat akin to him in this 'bolting' habit, but he, wise bird that he is in spite of his strange facial oddity, casts up the indigestible portions of his food in the form of pellets. Not so our mammalian friend

of the deep. As a result, the beaks that are swallowed and undigested set up irritation in the whale's interior regions, so that ambergris is secreted in dense masses. When at last the accumulation becomes too great for the huge cetacean to bear, he vomits in mid-ocean, and what to him is a happy release, becomes to the lucky finder of the ambergris, when cast up upon some distant shore, a veritable gold-mine! An instance is recorded by Mr. Aflalo of a large quantity being found by an old negress on the foreshore of one of our West Indian possessions. From the dense mass thrown up by the tide the lucky finder detached a portion weighing somewhere about five hundred ounces, and artfully contrived to hide what was left under a bush. One day the negress was advised to dispose of the so-called 'rubbish,' which was the reverse of pleasant as regards its aroma. This she had no hesitation in doing, and eventually what was left fell into the hands of some one who knew its intrinsic value. When sold in London it realized nearly £3,000!

Sometimes the whale does not cast up the ambergris that has accumulated within its body. When whales are thus captured, they are found to contain on occasions a great quantity of this most valuable product; and the captors of the monsters at once swell their banking account to no mean extent. The substance is greyish in colour and somewhat greasy. Of what use then

is ambergris? It is mostly used in the manufacture of perfumes, for skilful manipulation by the perfumer results in his being able to intensify and fix certain essential perfumes through its agency. In Eastern lands this greasy substance is actually drunk in tea, and its taste is said to be peculiar, but by no means unpleasant, while it acts as a sort of stimulant!

Oil in large quantities is also obtained from the blubber of whales, so that we are in a large measure indebted to these sea monsters for at least four most useful products.

The breeding habits of whales are unfortunately not known to us so well as we would like, and the reason for this will be apparent. Accurate and detailed observation is to a great extent impossible owing to the inaccessible habitats these interesting creatures possess. Not more than one young one—called a 'calf,' the male and female whales being known as a bull and cow respectively—is produced at a time, but the mother tends her charge with sedulous care and great courage. Indeed, in many respects these inhabitants of our seas set a bright example to some of their distant relatives upon land. A number of authentic instances are recorded of the devotion shown by the 'cow' towards her young one, and of her courage and self-sacrifice when danger threatens.

As regards the external features and general

Fig. 1.—Stranded.

Fig. 2.—Day's Dying Gleams.

Fig. 3.—Towards Sundown.

Fig. 4.—On the Kentish Coast.

characteristics of whales, I cannot do better than quote the following description from Mr. Aflalo's delightful book: 'The external characters of whales do not need to be very closely studied before they show how superficial is the supposed resemblance to fishes. The X-rays and the dissecting-knife soon show the so-called "fins" to be more of the nature of gloved hands. The whales—most of them at any rate—have five fingers like ourselves; only, needing their hands for swimming purposes, and having no use for the separate action of the fingers, they have been permitted to grow flesh gloves, thus transforming the useless hand into the useful flipper. The tail, again, though forked somewhat after the manner of that organ in some fishes, is attached horizontally, not vertically, a few strokes of this powerful propeller being sufficient to bring the whale up from the great depths at which it passes its life whenever it wants to breathe. The skin is not scaly like that of fishes, but perfectly smooth, having, moreover, beneath it an elastic cushion of fibrous blubber—a wonderful provision against the heavy pressure under which, for the most part, these animals live. Again, the whales have no gills, but in their place are endowed, like ourselves, with lungs, by the aid of which they breathe the air direct; and, in order that they may remain for considerable periods beneath the surface, they are further provided with

a marvellous means of aerating the blood. The blow-hole, through which they breathe, or "spout," closes hermetically with a powerful valve whenever they dive. In short, it would be difficult to find another order of living creatures better adapted to the peculiar conditions under which they have to live. Their mental standard cannot be very easily judged, but it is probably low. Indeed, as their brain does not amount to much more than three per cent. of their total bulk, some of the larger whales should be more stupid than most creatures.'

At least four kinds of Rorquals have been recorded from our British waters, and although some species are to be found in all parts of the world, these are mostly solitary whales, and great difficulty is experienced in making any detailed observation concerning them. Whales in any case are not subjects that the artist can paint direct, except on rare occasions, and so it comes about that although the Common and Lesser Rorquals are our most frequent visitors, our artist has pictured for us the Northern Rorqual, that being the only specimen he could locate when the picture required execution. It exhibits, however, the general characteristics of these inhabitants of the deep sea. The Northern Rorqual is, nevertheless, frequently found stranded on the shores of the British Isles. It feeds upon minute crustaceans and not on fish.

Commercially, Rorquals are not of great value. 'Whalebone' is not present in any large quantity; their blubber is very thin, and the oil to be obtained from them is not of a high quality, and commands only a low figure. These whales, too, are active and engaging animals, and it needs all the whaleman's courage and ingenuity to hunt them successfully. They are tremendously strong and rarely show themselves, beyond which when killed they sink rapidly, and the whale fisherman often sees his prize disappear before his eyes. So great an authority upon this subject as Mr. Frank T. Bullen remarks that he has never been fortunate enough to see a Rorqual calf, nor has he ever met a whaleman who has. He seems to be of the opinion that the cow has an instinctive desire to hide herself during the time of nursing her young one, and succeeds in so doing.

These huge monsters (and one species of Rorqual whale is the longest whale known) possess prodigious appetites, and so long as they confine their attentions to those parts of the world where fishing industries are not carried out to any great extent, well and good. When, however, these Rorquals pay our seas a visit at the time when the mackerel, herring, and other fish are found in large numbers around the coast, the fishermen suffer considerably from their ravages. For the fishermen's nets, what cares the Rorqual?

He will propel his huge body along, and tear these costly things into a thousand shreds, and with each dash he makes at the shoals of fish he takes into his capacious mouth as many as are sometimes caught during a whole night's fishing. People often say that there are as many fish in the sea as ever came out of it, but I have some doubts on the matter. I am informed by a well-known naturalist resident on the East Coast and near a famous fishing-ground, that during the past few years many different kinds of fish have considerably decreased in numbers. Perchance the coasting steamers, together with the immense popularity of various seaside resorts and the consequent bustle and excitement, have driven the fish to deeper waters. Whatever the reason may be, it seems to be a generally recognized fact that some species of fish are disappearing in numbers from our own seas, though they may depart for some quieter and more secluded ocean depths. We shall refer to this matter at greater length in Chapter III.

The Lesser Rorqual only attains a length of about thirty feet, but the Common species is found as long as seventy feet. The coloured illustration of the Northern Rorqual (Plate II., Fig. 2) will give the reader a good general idea of the appearance of this species. It is also known as Rudolfi's Rorqual. It does not attain a greater length than about fifty feet,

and has only been recorded around our coasts on a few occasions. The capaciousness of the mouth, the smallness of the eye, the position and structure of the flipper and tail, are all admirably shown in Mr. Berridge's most careful study of this wonder of the deep, and will convey a good impression of one of the monsters whose engaging and remarkable lives and habits we have so far considered.

The Humpback whale is so called because of the presence of a hump on the back and by the fold of the skin along the throat. This whale measures about fifty feet long, and is black in colour. It is found on some parts of our coast-line during the summer, and is much sought after by the whale fishermen. The length of the arms of this whale is remarkable, and when the huge creature is seen gambolling in the water (yes, it is true that even these sea monsters possess their playhours, as it were), waving its arms and lashing out with its tail, it is stated to be a most extraordinary sight. Those long arms are of distinct service to the Humpback cow, for she—fond, brave, and devoted mother that she is—folds an arm tenderly round her young calf, and bears it thus through the ocean's depths. Numberless enemies beset the brave mother's progress through the pathless sea. She is pursued, perchance, by immense sharks or other predatory sea creatures, they knowing full well of the presence of the young

one tenderly borne by the devoted 'cow.' She, too, is aware of their designs, and not for one single moment will she relax her hold of her precious charge. She makes straight for some hiding-place where she can rest for a time free from the enemies dodging her movements. What a splendid object-lesson of motherly love is here unfolded! Away goes the mother with her child, until a haven of refuge is at last reached, and there she rests, awhile, and right well does she deserve some amount of respite. Remember that the young calf—merely a few feet in length and a slim-built creature—like many other animal babies, cannot realize the dangers surrounding it, and instead of hugging tightly to its mother's body does all it possibly can to wriggle free! So one might continue the story, and tell of the Humpback's remarkable habit of practically starving herself rather than come forth from her hiding-place and run the risk of losing her young one. Yet, bear in mind, the latter has to be fed, and tugs away at the mother's breast until she, poor creature, finds her strength wellnigh exhausted.

This whale is in many respects a most interesting and delightful creature, and seems to enjoy its life to the very full. Cow, bull, and calf may often be seen prancing and gambolling together, simply revelling in the ocean's refreshing depths. It inhabits some of the most beautiful parts of the world, and seems not to

possess a care, excepting it be when the precious young one must of necessity be sheltered from its enemies.

Several kinds of parasites attack the Humpback, nor do they adhere to the outside of its body only, for limpets as large as a small saucer have actually been taken from its interior! It appears that the blubber in its belly is divided into longitudinal folds, and within the grooves limpets find a cosy and secure place of lodgement.

We now come to the Cachalot, or Sperm-whale, to which we have already referred. From the Cachalot we procure spermaceti, or sperm-oil; and, being a toothed whale and living on squid and cuttlefish, ambergris in large quantities is also obtained from this curious-looking denizen of the deep. This is a rare sea mammal around our own coasts, and is about sixty feet in length. It has been known to exceed this length, however, on occasions. Curious to relate, the head and body of the Cachalot are about equal in length. If the lower jaw of this monster be examined, it will be observed that there are about a score of pairs of good teeth, whilst in the upper jaw some rudimentary molars are present. It possesses also a swelling above the nose, by which it may be recognized. Unlike most other kinds of whales, the Sperm does not exhibit that maternal instinct of which we have already written. Indeed, within three or four weeks'

time the calf leaves its mother's side and joins a school of its relatives, playing with them, and mixing freely among them and procuring food on its own account. This is not a difficult feat to accomplish, for when in the vicinity of good fishing-grounds Master Cachalot need only open his capacious mouth and await results. The unwary cuttlefish, squids, and other fish galore swim unconsciously into the youngster's mouth, he having kept his eyes open when he saw his mother feeding, and so learned the clever but simple trick for himself.

The Bottle-nose whale is mostly found in the northern part of our island, and may be identified by what is known as a beak-like snout and a truncated forehead. It averages about thirty feet in length, and possesses two teeth in the bottom jaw.

Strictly speaking, the Porpoise should next claim our attention if we rigidly followed out scientific sequence (the same being a whale); but it is not our aim in the present story to adhere to any hard-and-fast rule in this respect, and this particular chapter is concerned with what we may accurately term sea monsters. The Porpoise-pig will receive consideration in our next chapter, so that we may now proceed to give short biographies of two further whales known as the 'Beluga,' or White whale, and the Narwhal. The former is

restricted to the waters of the North, but if only on account of its pure white colour, it is deserving of mention. Occasionally this white colour is intermixed with yellow in the form of streaks. It is from this Beluga, or White whale, that we obtain our 'porpoise'-hide boots and boot-laces; and a further interesting feature in connexion with this species is that it does not in foreign countries restrict its operations to the sea, ascending rivers in search of salmon in a similar manner to the Common Porpoise, as we shall presently see. The Beluga only averages about twelve feet in length, and belongs to a different family—namely, the *Delphinidae*—from the creatures we have previously considered. There is a marked similarity between it and the Narwhal, if we except the tusk, or horn, that the latter possesses. This Narwhal is the most singular and strange member of the Dolphin family. It is about twenty-four feet in length (if the tusk be included), and, although a rare British species, is worthy of inclusion in our story. The horn, or tusk, which gives this cetacean such a peculiar appearance, is an abnormal tooth, which is as much as eight feet in length. This tooth is present on the left-hand side of the upper jaw, whilst on the opposite side a further undeveloped tooth appears; but, excepting on rare occasions, it does not develop to the extraordinary dimensions of its fellow. The tooth is twisted in form, and is confined

to the male Narwhal only. So large are these teeth in some instances that, as Mr. Bullen points out, they have been utilized for bedposts. He also mentions the interesting point that 'the idea of the Unicorn as shown in our royal arms may have been taken from this extraordinary dolphin; much more reasonably, one would think, than that it should have been taken from the ungainly rhinoceros.' The tooth, or horn, is yellow in colour, and sticks straight out from the animal's nose. There is a ridge running down the back of the Narwhal's body which replaces a dorsal fin, and the colour of this species is greyish-white spotted with a darker colour. It is stated on good authority that this remarkable horn is utilized by this species for the purpose of transfixing fish. It resorts to the shallow waters of the Arctic regions, where it pursues its fishing exploits with considerable agility.

For the present we leave these sea mammals so that we may continue the first part of our story devoted to sea monsters. We shall finish the consideration of the former in our next chapter. Although sharks are not to be compared in point of size with such huge sea monsters as those previously under review, as fish monsters we may certainly accord them a place in this opening chapter. First comes the Blue shark, which species has been found up to six feet in length. It is a magnificent fish, in its deep and light blue-and-

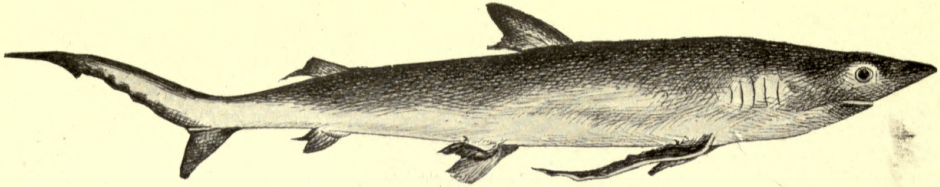


Fig. 5.—Blue Shark (*Carcharias glaucus*).

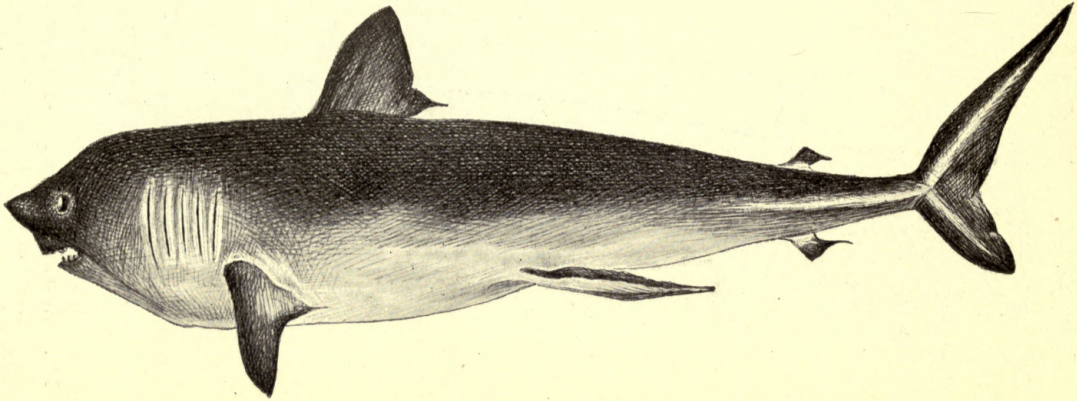


Fig. 6.—Porbeagle Shark (*Lamna cornubica*).

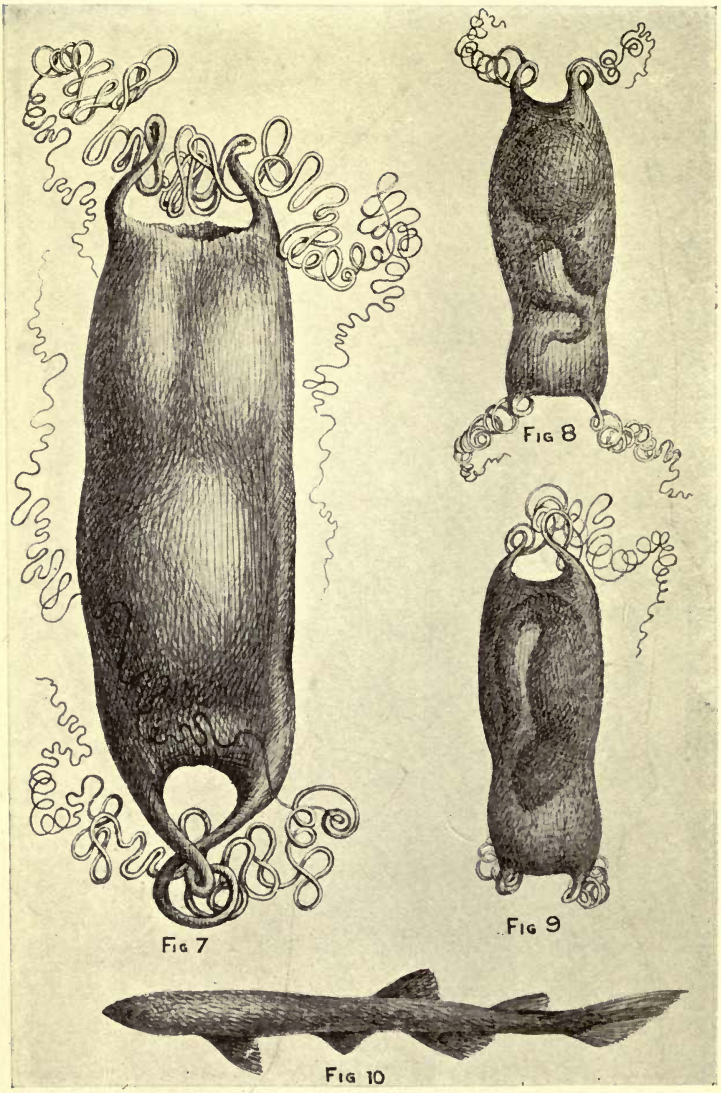



Fig. 7.—'Purse' or Egg-case of Nurse-hound (*Scyllium catulus*).

„ 8.—'Purse' of Rough-hound (*Scyllium canicula*). (Showing Embryo at Early Stage.)

„ 9.—'Purse' of Rough-hound (*Scyllium canicula*). (Showing Embryo at Later Stage.)

„ 10.—Young Rough-hound just emerged from Egg-case.

white colourings. It has the upper lobe of the tail notched and a pointed snout, as carefully delineated in Fig. 5. A good specimen will weigh forty or fifty pounds, and much damage is done to fishing-nets, this species following the shoals of mackerel, pilchards, and other fish upon which it feeds.

Most kinds of sharks lay eggs, these latter consisting of oblong cases composed of a horny substance. They are known as 'purses.' Three or four kinds, however, bring forth their young alive, and in this connexion we may mention the Tope. This shark runs up to six feet in length and eighty pounds in weight. It restricts its operations to our southern and eastern coasts. It is grey on the upper surface and white below, and is what is known as a viviparous species—namely, it produces its young alive. As many as from twenty to forty young are brought forth about the month of June.

The Porbeagle, unlike the two species already mentioned, does not possess a nictitating, or closing, membrane over the eye. It has a deep body and wide gill-openings, and its general form is well depicted in Fig. 6. It is deep grey or brown on the upper parts and white underneath, measuring up to, and sometimes over, ten feet. The pointed snout of the Blue shark, it will be noticed from Figs. 5 and 6, is not present in this species.

Sharks are useful scavengers of the sea. They pounce upon and greedily devour carrion of various kinds, including the dead bodies of human beings, dead and living whales, &c. Unlike most fish (both fresh- and salt-water inhabitants) the shark, like the whale, is a most attentive and devoted parent; so much so that the brave and anxious mother will, when danger threatens, open wide her gaping mouth and take into the seclusion of her bosom the young sharks. Here they may remain for many days, and are fed and tended until the time arrives when they may be let out of their temporary dwelling-place to fight their own battles in the great struggle for existence which is continually going on in the animal world.

Of the Thresher shark our artist has given a good pictorial representation in Plate II., Fig. 1. It will be observed from the species figured that the upper lobe of the tail is considerably longer than the lower one, and the tapering body will also be apparent.

You will doubtless be surprised to know that, strictly speaking, these sea monsters have not a single bone (as we understand the meaning of the word) in the whole of their bodies! From the largest to the smallest of them, only cartilage is present, no bone—cartilage, of course, being gristle.

In the Thresher shark the extraordinary length of the upper lobe of the tail is sufficient in itself to

distinguish the species at once, even at a distance. It sometimes measures as much as the head and body put together.

This is not only a common British species, but it has a very wide distribution indeed. As will be seen from our coloured plate, it is bluish-grey above and white below. It grows to a length of about fifteen feet if the long tail be included. The reader will note the smallness of the eye and the absence of a closing membrane. Although the teeth are small, there seems little doubt that this shark can, and does, attack the whale and other large animals; but in our own waters various fish such as mackerel and pilchards are largely eaten. This is an oviparous, or egg-laying, species, depositing 'purses,' and possesses most prodigious leaping powers.

The Basking shark is our largest species, measuring anything between thirty and forty feet. This sea monster is darkish above (from dark green to black) with a stain of reddish-brown over the snout, and white or yellow on the under parts. This is not only our largest shark, but is to be regarded as one of the largest living fishes. Like some of the whales, it possesses a contrivance which gives it the power of sorting out, as it were, its food. The important organs which accomplish this remarkable operation are called gill-rakers, and by means of them the water taken in is

filtered, and the diminutive organisms on which it feeds are retained. As in the last species mentioned, the eye is small and the nictitant membrane is absent. The tail is keel-shaped upon the sides, and does not possess the extraordinary appearance of that of the Thresher, both lobes being distinct.

We now reach the Dog-fishes. The first to claim attention is the Spotted Nurse, also known as the 'Bounce' or 'Cat-fish.' These dog-fishes are closely allied to the sharks, but do not compete with them in point of size. They are called Ground sharks, and feed on various crustacea and also carrion. The Nurse has been known to attain a length of over four feet. The coloration above and upon the sides is reddish-brown, largely spotted with a darker colour. Underneath it is white. It is mostly nocturnal in its feeding habits, and is oviparous, producing 'purses' as mentioned in the case of some species previously dealt with. A plate illustrating three of these egg-cases and a young Rough-hound just emerged will be seen in Figs. 7 to 10. One would imagine that sharks and dog-fishes would not be eaten by human beings to any extent, but the fish now under review is partaken of very largely.

The Spur-dog, or Picked Dog, is about the same length as the last-named, but feeds upon fish. It is a common species, and possesses a sharp spine in

front of each dorsal fin, which is sufficient to identify it. Unlike the Nurse, the Spur-dog is viviparous, producing its young alive, and does not appear to breed at any particular season of the year. In colour it is grey above, white underneath, with dashes of faint yellow upon the belly. The small teeth are sharpest on the inner edge, and this fish possesses large eyes.

The last fish with which we are concerned in this chapter before coming to the Octopus is the Angel, or Monk-fish. This is a common inhabitant of many of the waters surrounding our island, and has a partiality for sandy coasts. Beyond this it is found in all parts of the world in both tropical and temperate seas. It is remarkable for its flattened shape, and is placed between the Sharks and the Rays. It is a sort of connecting-link between the two groups. It has very large and prominent pectoral fins, which, being likened to the 'wings' of angels, has resulted in the name of Angel being conferred upon it. It attains a length of over seven feet and as much as fifty pounds in weight. Its colour is dark brown or grey above, blotched prominently, but lighter below. Structurally this fish —which attracts so much attention on the fishmonger's slab—presents many peculiar features. Its eyes, for instance, are placed wide apart; in front of the nostrils there is a loose portion of skin; the dorsal fins are situate near the tail, and do not possess any spines. This is

a fish-eating species, and is viviparous, about twenty young ones being born during the summer.

The story of the truly remarkable Octopus must now be told. An excellent representation of this sea monster is shown in Plate I., Fig. 3. As will be observed, it is indeed a most uncanny-looking creature, with its long arms, large eyes, and general appearance; and we may well imagine the extraordinary tales which have been told of some of these denizens of the sea. That great pioneer in natural history—Aristotle—who wrestled so wonderfully with the structures and classification of animals long before the birth of Christ, devoted a considerable amount of attention to this typical sea monster. The work of this original and painstaking naturalist proved remarkably accurate, though for some hundreds of years nothing further was done towards classifying the animal kingdom.

This mystical creature of the deep, then, has the habit of changing its colour to match its surroundings. It secretes a phenomenal supply of a kind of inky fluid, which it discharges when disturbed or irritated—and its temper is not by any means a sweet one. This secretion, with the formidable and extraordinary appearance of the creature, tends to make it one of the most amazing inhabitants of the deep; and when one carefully inquires into the biography of the octopus, the wonder deepens as to its place in the economy of Nature. It is a

voracious, omnivorous, and hideous animal. It writhes its arms in a most weird and awe-inspiring manner, gleams intense hatred and fury from its eyes, and when it attacks a human being it 'stings' far more acutely than the worst demon that exists among the giant jelly-fish about which we shall have something to say in Chapter VIII.

This creature's resort is mostly at the bottom of shallow seas, where it drags its unwieldy body along by means of its arms, which possess—as you will see from our picture—sucking-discs. These grip any object they embrace in a most remarkable manner. The octopus belongs to the Mollusca, and, like them, possesses a prodigious appetite and extraordinary powers of digestion. As one of the Invertebrates, or animals which do not possess a backbone, it is much sought after for food by other inhabitants of the sea. Its flesh—if such it can be called—being very succulent, many of its enemies prove themselves well able to conquer the wonderful power of its writhing arms and the ravages of its beak. The deeds and misdeeds of the octopus have to a great extent been exaggerated. The body itself is not of large dimensions, but the tentacles attain a length of at least four feet; and when seen dragging its cumbersome and ungainly person along the bed of a shallow sea, one is awestruck with its appearance, and it well deserves to be accorded

a position in the present part of our story. Its remarkable appearance and extraordinary habits rather than its size make it worthy of mention here. The sucking-discs upon the inside of each arm are very numerous indeed, and are well shown in our coloured plate. By their aid weighty objects can be lifted in a most bewildering manner, each sucker acting as a sort of air-pump which possesses automatic movement. In an experiment he carried out, Mr. Bullen found that a sucker less than half an inch across was capable of lifting a tin dish weighing more than a pound, and the octopus suspended it in the air for several minutes. The creature had been some time out of water, and was not far from death, so that its power of suction by means of the *acetabulae*, or sucking-discs, was very much diminished.

Sometimes the octopus emerges from a conflict minus an arm or two, but it has the habit of replacing its lost limbs at no distant date, a remark which applies to various other creatures akin to it.

The female deposits her eggs in bunches—each bunch being made up of nearly a thousand eggs—on a rock at the bed of the ocean. The number is remarkable, but it should be borne in mind that numerous enemies prey upon these eggs, and it is necessary that a vast quantity should be laid. She jealously guards her treasures, and exhibits much

maternal affection—so much so that she shelters them continuously; and should a male octopus approach her, she does not hesitate to spurt out some fluid from her ink-bag, and, if the circumstances demand it, and she is in a particularly bad temper, she will pounce upon and devour him—for these are cannibals of the sea!

By the agency of a tube which is possessed by this amazing creature, water is spurted out, and by means of this the bunches of eggs are cleansed. When it is remembered that as many as forty or fifty of these egg-bunches are deposited by one female, the reader will gain some idea of the busy life which is carried out in Octopus-land during the breeding-season, the guarding, hatching, and cleansing of the eggs occupying constant and unremitting attention.

It is difficult, as we have said, to form any opinion of the place occupied by the octopus in the economy of Nature; but, after all, we have much to learn concerning its true position in the world of animal life. That it affords good food for its fellows of the sea is an undisputed fact. It also acts as a scavenger, and does some amount of good in clearing away various offal. We may gain interesting information from a careful and minute study of the octopus, if for no other reason, because, although claiming kinship with the Invertebrates, it exhibits very considerable

intelligence in dealing with its enemies ; and this, for an animal devoid of a backbone, is very remarkable to observe. The female's habit of jealously and indeed lovingly guarding her eggs is a trait we must not fail to overlook. Some day we may hope to form a more accurate and lucid conception of the marvellous life and habits of one of the strangest denizens of the sea. At present it is shrouded in a good deal of mystery, although the observations of some of our greatest naturalists, from Aristotle to those happily still with us to-day, have done much to unravel some of the secrets of its life and to set at rest the incorrect and misleading statements which various well-known writers of fiction have made from time to time. In the world of animal life truth is in many instances stranger than fiction !

## CHAPTER II

### PORPOISES, DOLPHINS, AND SEALS

Porpoises and Dolphins belong, like whales, to the *Cetacea*, and are, of course, mammals, not fish. The Common porpoise (*Phocaena communis*) and the Common dolphin (*Delphinus delphis*) are two of the sea mammals most frequently found around our coasts. Nevertheless, great curiosity is evinced by visitors at our seaside resorts when one of them is exhibited which has been stranded upon the shore or caught in the trawl-nets of the fishermen. I remember last summer, when visiting the quiet little town of Filey in Yorkshire (famous not only for its Brig and cliffs, but also as the home of 'the Walking Parson,' whom I have the privilege of numbering among my friends), being shown a fine specimen of the Common porpoise. A couple of boys had something hidden under a piece of brown paper, and were most anxious that my friend and I should pay a penny each 'to see the Porpus-Pig, sir!' This request was at once complied with, and a hasty snap-shot of the scene is depicted in Fig. 11. The

Common porpoise attains a length of five feet, but the specimen shown in the picture only measured about four feet. It had recently been brought ashore —having been caught in the trawl-nets—and attracted considerable attention from the visitors. The beautiful dark blackish-green colour on the back and upper surface and the white belly looked a picture in the autumn sunshine, and the precocious youths seen in the photograph appeared to be making quite a small fortune as a result of exhibiting their strange quarry.

Sometimes porpoises may be seen in shoals off our coasts, and have the habit of cleaving the water with their triangular back fin. When off Scarborough in August 1907 I observed with much interest through my glasses what I took to be a school of these animals gambolling in the sparkling ocean. Every now and again the objects temporarily disappeared, and my excitement grew intense until, to my dismay, I discovered that the incoming tide was covering some sharp-edged rocks that mostly lay hidden below!

Some authorities assert that *P. communis* attains as great a length as from six to eight feet, but this must surely be more than the average length for this species. It is a gregarious animal—hence my stupidity in mistaking the summits of several rocks for porpoises playing hide-and-seek in the sea—and produces one young one at a time. This is called a calf, like the

young of the whale; indeed, porpoises and dolphins are whales, claiming relationship with the *Cetacea*, as already shown. Unlike the whales treated of in the previous chapter, however, the porpoise ascends rivers in search of salmon. Its chief diet is composed of herrings—it is exclusively a fish-feeder—but when the shoals of these are disbanded it will make its way up rivers after the luscious salmon. A coloured representation of our Common species is shown in our frontispiece (Plate I., Fig. 1).

From this creature excellent oil may be obtained, and this is of great use and value. Beyond this its beautiful hide is of service for making up into boots. In days gone by this animal was looked upon as a fish, and was, in consequence, permitted to be eaten during Lent. The dorsal fin—which is well shown in the photograph and in the coloured picture—bears a row of tubercles along its margin. The teeth number from sixteen to twenty-six on each half of each jaw.

Porpoises are active, engaging, and pleasant sea-folk. They rush through the water at an amazing speed. Life seems to them a perfect joy. They are often met with in enormous companies, some thousands congregating together, and as they frequently follow slow-moving ships, it is possible to watch their captivating habits with some degree of comfort and detail. The presence of these creatures of the sea is supposed, and

not altogether without reason, to presage bad weather. Their extraordinary activity and restlessness accounts for this weather-lore being connected with them, and it is interesting to notice that their amazing manœuvres cease as abruptly as they begin. Then they commence again in a mad and yet delightful scamper through the liquid depths, and those who have never experienced the keen enjoyment of spending some hours in Porpoise-land have a rich fund of entertainment in store when the opportunity is provided.

The mother porpoise is most attentive to her offspring, and it is noticeable how the calf contrives to keep close by its parent's side when she is participating with her fellows in some lively and frolicsome escapade. Sometimes it is with the greatest difficulty the youngster can be located, so close does she cling to her mother's body. When young the porpoise-pig is no larger than a mackerel, and a very attractive little animal it is.

One other trait should be mentioned here concerning these interesting inhabitants of the sea: they are cannibals! If one of their number is wounded or in distress, the remaining members of the shoal will pounce upon its body, and in less time almost than it takes to tell the story, will greedily tear it to pieces and leave nothing but the skeleton remaining!

The Grampus, or 'Killer' as it is sometimes called, is not nearly so common as the last-named species, but

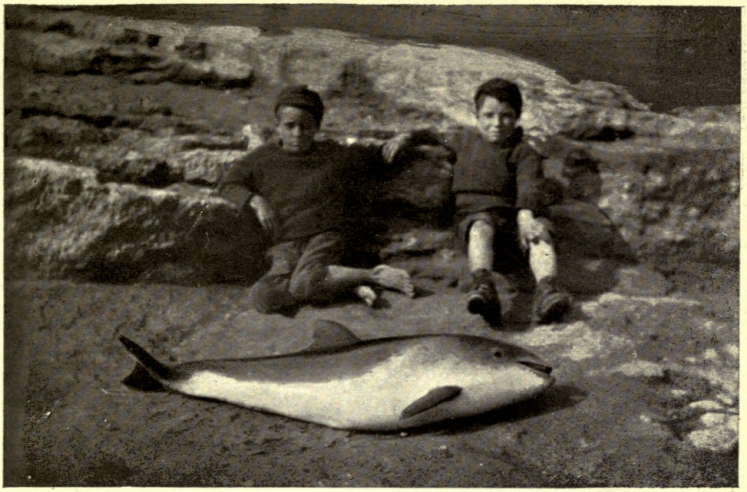


Fig. 11.—Porpoise.

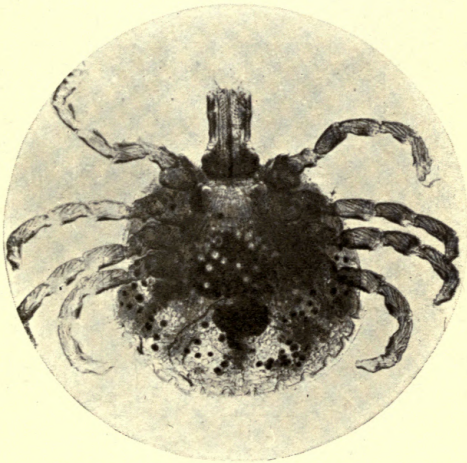


Fig. 12.—Parasite of Seal.

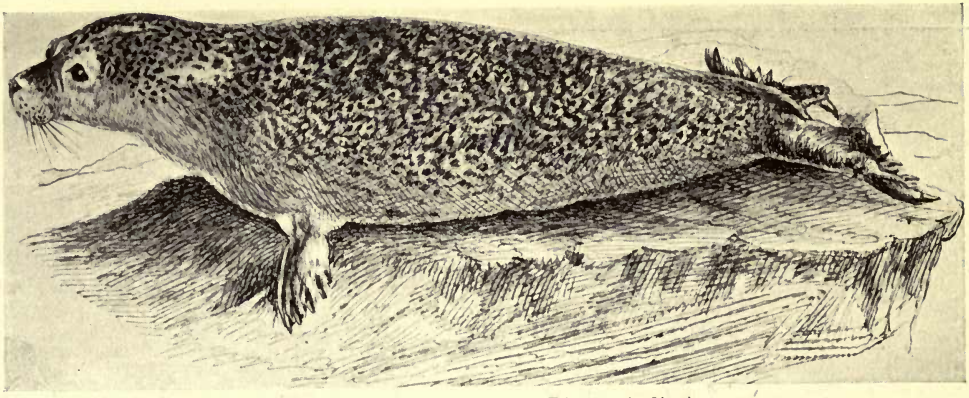


Fig. 13.—Common Seal (*Phoca vitulina*).

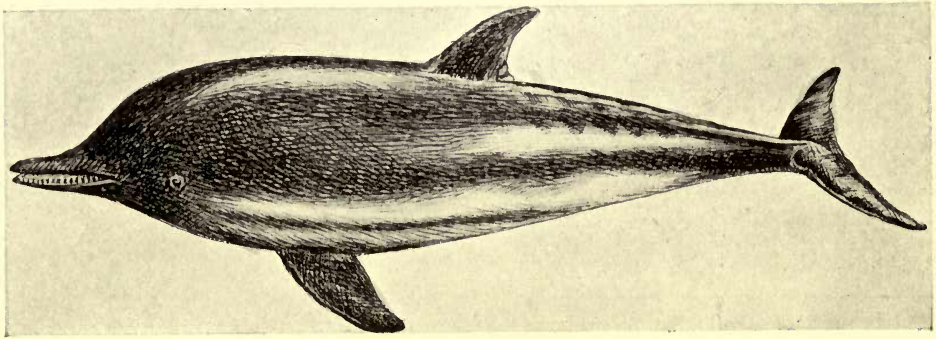


Fig. 14.—Dolphin (*Delphinus delphis*).

is worthy of inclusion in our story, because it not only feeds upon fish, but also on cetaceans, including its near relative the porpoise! This grampus is a much larger animal than the latter, attaining a length of from twenty to thirty feet. It is of the same colour as the porpoise, but has a prominent patch of white above the eye. This is a powerful and rapacious whale, and it has been recorded that no less than thirteen porpoises and fourteen seals have been taken from its stomach! Its powers of digestion must be enormous. It will also attack its much larger fellows of the sea, and when these battles take place the larger whale bellows in a similar manner to a bull when bitten by a dog. The long and high dorsal fin is a characteristic feature of this species, and it possesses sharp teeth in both jaws.

Before finally bidding adieu to these interesting inhabitants of the sea, we may briefly consider the biography of the last member upon our list, the Dolphin. This animal has a beak-like snout, from which it has been called 'Bottle-nose'; but as there is a distinct species of dolphin (and a much rarer animal) known by this name, much confusion is occasioned by the introduction and use of these local names. From the black-and-white illustration shown in Fig. 14, some idea may be obtained of this animal's general appearance, and the reader will doubtless agree that, confusing as it is to call this species the Bottle-nose, the name is at any rate

well deserved! Unlike the porpoise, the species now under consideration does not ascend rivers; but in India there are dolphins which resort to rivers and never descend to the sea.

The colour of the dolphin is black, stained with yellow, and it attains a length of about seven feet. This animal exhibits such marked variation in its coloration and in one or two points concerning its anatomy that it has been split up into no less than seventeen so-called 'species.' Into the pros and cons of this matter it is not within our province to enter; suffice it to say that most students of mammalogy are of opinion that the claims of these varieties cannot admit of the animals being divided up into distinct species.

We are fortunate enough to be able to give a coloured representation of the Common Seal (*Phoca vitulina*) in our frontispiece, and also a drawing in black-and-white in Fig. 13. In the former the artist has depicted this most interesting mammal swimming; in the second illustration it is shown resting upon a rock.

Seals belong to the order *Carnivora*, and are allied to such animals as the wild cat, fox, stoat, weasel, badger, and otter. Unlike any of the latter, however, with the exception of the beautiful otter, the seal mostly resorts to the sea and seashore, and is therefore justly entitled to inclusion in our story.

Our island home is visited by five kinds of seals

and the walrus; but only two species are at all common, and it is to these we may now devote our attention.

Seals live upon fish, and are stated to do considerable damage among salmon. There seems to be a difference of opinion on the matter, however, and the poor seal is often mercilessly slain for deeds it never committed. Moreover, our British seals are of no value commercially, and it is a thousand pities that such an interesting visitor to our coast should so often meet with a bad reception.

I heard a good story recently, which I think is well worth telling here. I can vouch for its accuracy. A Scotch friend of mine, one of those students of Nature who try to read her lovingly and intelligently, was giving a lecture entitled 'Curious and Common things in Nature.' A good and appreciative audience had gathered to hear him, and were highly interested in his practical and original observations. It appears he hadonce kept a seal as a pet, and told, with immense seriousness, of its habits in captivity, and how eventually he had to mourn its untimely loss. Confinement did not suit the animal, it became a glutton, and was one day taken very ill. The local doctor was sent for, who duly prescribed something to endeavour to save the seal's life. The animal, however, succumbed. Judge of the amusement and hearty laughter which was occasioned at the lecture by an old Scotch seaman who

was present audibly remarking, 'Aye, aye, the doctor killed the seal!' The doctor, moreover, was among the audience!

The Common seal attains a length of from four to five feet. In colour it is brownish-grey, with darker grey spots and blotches, the latter being well portrayed in Fig. 13. It does not lead a strictly marine life, as it will ascend rivers, and also make itself thoroughly at home in and around an inland sheet of water. This species has a very wide distribution, and is not only found in the seas surrounding our own shores, but inhabits the waters of Arctic regions, as well as America and the North Pacific.

The flippers (one of which is well shown in the specimen in our frontispiece) enable this animal to be at once distinguished from its smaller and yet near relative the otter. By means of these flippers the seal is enabled to spend most of its time in an aquatic condition.

It will be noted from our illustrations that no external ears are present. No British seal possesses these external organs. Our own species are also deficient of under-fur, which thus renders them valueless commercially. The Common seal breeds during the summer months in the north. One or perhaps two young ones are born, and these have white fur during their babyhood. Unlike young moorhens and many

other kinds of animals that might be mentioned, young seals do not take to the water kindly. This seems a curious habit for a strictly aquatic species. So reluctant are these baby seals to take their first plunge that on occasions their parents have to force them into the water. How very different this is from the fluffy little water-hens, who will dive into the water the moment they are born, and actually, as I have seen them, with the shells adhering to their backs! There seems something wrong here in this dislike of the young seal for the water, and it is a problem in Seal-land that requires elucidation. Is any solution forth-coming?

The fine moustache borne by this animal is well shown in both our pictures, and those of my readers who have visited the Zoological Gardens in Regent's Park and watched the sea-lions there when being fed will have obtained some general idea of the wonderful powers of diving and swimming which these marine carnivora possess. The sea-lion is not very distantly related to the animals whose histories we are at present considering. Like the poor little mole (four distinct parasites upon the body of one animal were illustrated in my *Story of Insect Life*), the bats, the swallows, and many other creatures, seals have parasites living upon their bodies. Many extra-ordinary parasites were shown in the volume above

mentioned, but among them all I do not think a stranger one appeared than that illustrated in Fig. 12. I am sometimes asked by young folks (and old ones, too, for that matter) what a parasite really is. I cannot do better, perhaps, than repeat what I have often stated at my lectures in various parts of the country. De Morgan puts the matter clearly and humorously in his *Budget of Paradoxes*:

Great Fleas have little Fleas upon their backs to bite 'em,
And little Fleas have lesser Fleas, and so *ad infinitum*;
And the great Fleas themselves, in turn, have greater Fleas to go on,
Whilst these, again, have greater still, and greater still, and so on.

Much merriment has been caused when I have recited these humorous lines. One can gain from them a very clear idea of what a parasite is.

The only other seal which claims our attention is the Grey seal (*Halichoerus grypus*). This is a large animal of about eight feet in length, and is grey in colour, spotted and blotched like the last species under review. It is not an uncommon inhabitant of our shores, and is particularly fond of tenanting the neighbourhood of the Hebrides and the coast of Argyllshire. The Grey seal possesses a flat skull, and Mr. Aflalo says that this species 'is considered to lack the intelligence that characterizes the rest of the family, a deficiency that is chiefly interesting by reason of its association

with the flat skull and expressionless face. The grinding teeth are without tubercles.'

The Walrus, or Sea-cow, is a seal that rarely visits our shores, yet it is worthy of mention because of the long tusks and bristling moustache which give it such a fearsome appearance.

Before closing this short chapter it will be interesting to add a few details about whale- and seal-fishing, as they will afford the reader some idea of the commercial value of these animals and their distribution. I bracket the two industries together, as they are carried out very often under the same auspices. Mr. Thomas Southwell, of Norwich, has for a number of years contributed a valuable paper on the seal and whale fisheries to the pages of *The Zoologist*, from the volume of which for 1905 the following notes are taken.

In 1904 the sealing fleet which sailed from Newfoundland consisted of twenty-one steamers. The date of sailing is usually March 10, and at times the vessels experience great difficulty in forcing their way through the ice-strewn seas as they proceed towards the fishing-grounds. After an absence of sixteen days only, the good ship *Aurora* returned into port with no less than 34,849 seals, only 189 of which were old Harps!

The breeding-ground was located about seventy miles N.E. of Fogo, which is an island off the N.W. coast of Newfoundland in the Atlantic Ocean. The

captain of the ship estimated that in this district there were present not less than 100,000 young seals, and the first day's fishing resulted in 4,000 'pelts' being taken on board.

The *Walrus*—aptly named for an occupation of this kind—returned laden with 16,720 seals, but some of the smaller vessels could not successfully combat with the ice, and only took small catches. For instance, the *Kite*, a small vessel of 190 tons, but with a crew of 89, only totalled 733 seals.

Young seals, Hood seals particularly, are much sought after by these fisher-folk, so as to preserve the adults for the purpose of breeding another season. During the season under review the *Diana* alone was fortunate enough to obtain about 7,000 young Hood seals.

The twenty-one vessels averaged a take of 13,546 seals each, eight of them exceeding that number and nineteen falling below it; eight vessels had more than 16,000 each, four others numbered between 10,000 and 13,000, and nine under 10,000. The *Aurora* headed the list with 34,849. The total catch amounted to 284,473, valued at £80,758, as against 317,760, valued at £89,958, taken in the previous season.

Great losses are experienced by these seal fishermen, for whereas one vessel is reported to have killed and 'panned' 30,000 seals in ten days, her final return

was only 17,300. As Mr. Southwell remarks, 'It is therefore evident that vastly more young seals were killed than were secured, and this wasteful method cannot fail to be regarded with regret.'

In 1905 twenty-two steamers took part in the season's fishery at Newfoundland, and the result was the capture of 177,100 seals. One vessel alone, the *Eagle*, returned in fifteen days after leaving St. John's with no less than 32,064, whilst the *Southern Cross* only accounted for 883. The average for the whole fleet was 8,050, the total net weight of produce was 4,189 tons, and the value £62,234.

For a quarter of a century Mr. Southwell has contributed these interesting notes upon an important fishing industry. He gives the following wonderful figures. During twenty-five years the total number of seals which fell to the steamers was 5,624,071. The largest catch took place in 1900, the number reaching 353,276, and the smallest in 1893—namely, 109,304. These stupendous returns do not include the animals taken on the shore, by the schooners, or the large number lost by the wasteful system of 'panning,' which would largely augment the figures given.

During a period of fifty years the Board of Trade returns show that the produce of about sixteen and a half millions of seals was exported from Newfoundland and Labrador, representing a money value of more than

nine and a half million pounds. Yet, Mr. Southwell states, during the past twenty-five years (he is writing in 1905) there seems to be no serious falling off in the average supply. 'The continued prosperity,' he goes on to say, 'of this important industry depends largely upon its being judiciously regulated. In this respect great improvements have been made of late years; but seeing the risk of losing panned pelts from various causes, such as fog or bad weather, it must be prejudicial to kill more seals than there is a fair prospect of getting on board in a reasonable time. Warning should be taken by the fate of the Greenland sealing, which since the year 1895 has been abandoned by the Scottish steamers as unprofitable.

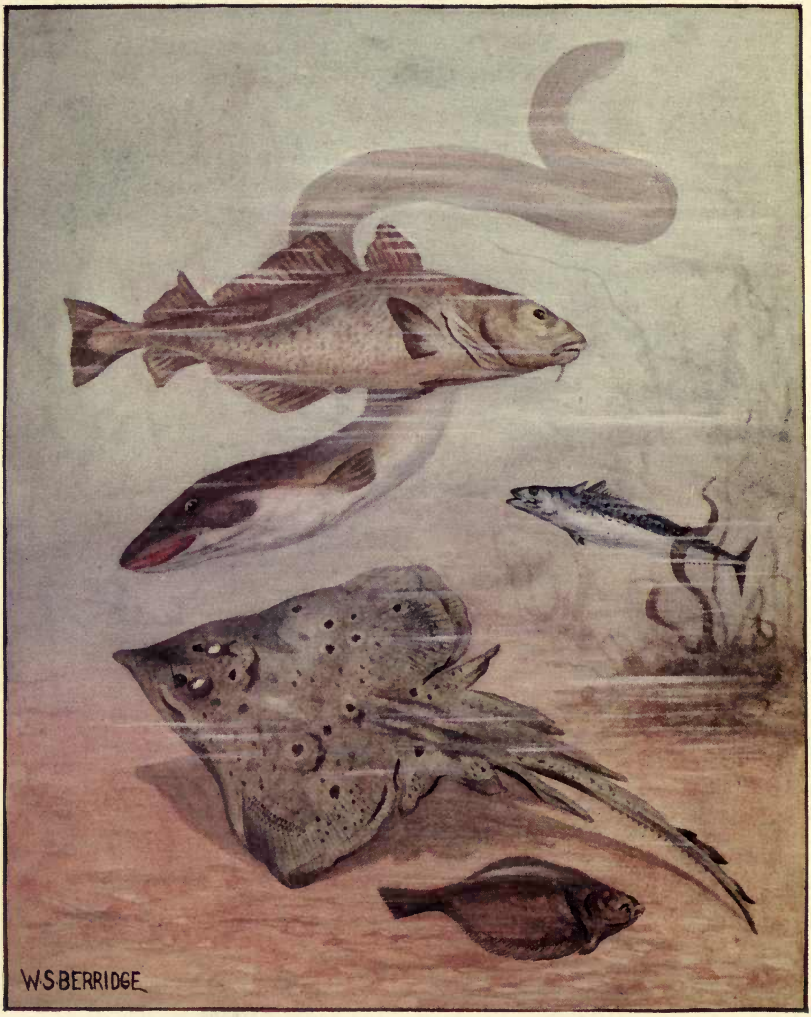
'The great natural safeguards against extermination are the difficulty of approaching the patches of breeding seals, and the practical immunity of the old ones. In the season of 1904, out of a total of 284,473 seals killed by the steamers, only 5,180 were old Harp seals, and 130 old Hoods. In this respect things are greatly improved. In some years, too, large numbers of the breeding seals escape detection altogether, as has probably been the case in the past season (1905). With these safeguards, and careful regulations of the fishery, I see no reason to fear its early failure, and trust it may long remain the important source of revenue to the colony it is at present.'

We now come to the whale fishery (we gain the particulars and figures from *The Zoologist*). Mr. Southwell in the first instance comments upon the changes that have taken place in the nature of the produce brought home from the Arctic Seas when one compares the reports of past years. Years ago, he tells us, the Black whale was the best species for the whale-fishermen to concentrate their energies upon, supplemented only by such White whales (already mentioned in our last chapter), seals, and walruses as could be conveniently secured without neglecting the main object of pursuit. As these valuable animals became fewer, others engaged the fisherfolk's attention, and seals held a foremost position in the returns. In course of time this seal-fishing became unprofitable, until in 1883 the Bottle-nose whale was sought after, and in that year 535 of these whales were killed by the Greenland vessels. The next year the number fell to 317, after which the industry depreciated and suffered the same fate as the seal fishery, and was then given over to the efforts of the Scandinavians, whose methods are more economical than ours, and who probably still find it profitable. Thereafter, the Right whale failed in the Greenland Seas, where it had once been so abundant, and other changes have taken place that need not be detailed. In 1904 five vessels from Dundee were occupied in the whale-

fishery—four in Davis Strait and one in Hudson Strait. The total return for the five whalers was as follows: 11 Right whales, 168 White whales, 45 walruses, 1,135 seals, 109 bears, 211 foxes, and 30 musk-oxen, with 114 tuns of oil and 113 cwt. of bone. The probable value of the season's produce would be about £16,250.

These notes and figures will show the vast numbers of these animals which either tenant the waters or the adjoining lands, and will give some idea of their distribution and the value of the products obtained. To the painstaking recorder of these statistics we are indebted beyond measure.

PLATE III.




1. Cod. 2. Conger Eel. 3. Mackerel. 4. Skate. 5. Plaice.

p. 65.

## CHAPTER III

### SOME COMMON SEA FISHES

FROM the vast array of fish that populate the ocean we can only hope in the present instance to make a small selection. Our list will, however, be found to contain common representatives of all the more important families. Whilst we could almost indefinitely extend the number of species treated of, and deal with many kinds unknown either by sight or name to the general reader, it is rather our aim to consider briefly the salient characteristic of our commonest British Sea Fish. A number of them (if not all) will be known by sight, nearly all those dealt with being edible ; but we shall not study them from a gastronomic standpoint. Are there as many fish in the sea as ever came out of it? The statement is often being made and quoted, but is it correct? When I was in the North of England last autumn one of our foremost Yorkshire naturalists assured me that the diminution in the fishes off that coast had been most marked during recent years. That keen East-Coast naturalist, Mr. Arthur H. Patterson, writing in *The Zoologist* in 1904, also states that 'The year 1904,

so far as occurrences of rare and interesting fishes are concerned, has, to me, been a most disappointing one. This is the first year for some considerable period wherein I have been unable to record at least one new species for the county of Norfolk. I have every reason to believe that my shrimper friends and others have been equally alert for strange marine products with which to delight me ; but there has been a decided paucity of fishes other than those of common and everyday occurrence ; and during the present herring fishery the same conditions have obtained. In looking through my 'note-book' for the past year I have also to regret a want of the usual interesting items referring to strange crustaceans, and even birds ; and as for cetaceans, my records are practically nil. The incursion of so many snorting and restless steam-luggers into the haunts of these equally queer sea monsters would seem to have had the effect of scaring them off the fishing-grounds. Only two porpoises, to my knowledge, have so far been landed.'

Now, whilst it may be, and probably is, true that the fish population from British waters is decreasing, from figures which are obtainable it seems that many of our British species are simply driven away to other haunts, beyond which the gradual depletion of the fishing-beds of the North Sea is also accounted for by the practice of taking and landing immature fish.

When it is stated that no less than one hundred and fifty-one tons of immature fish have been taken away from Billingsgate Market alone, and that an appalling destruction of young and unsaleable fish is constantly going on owing to the absence of proper regulations, it will be seen how disastrous the sale of immature fish is in depopulating our seas. In other countries there is a limit for flat-fish as well as those too small in size; and it certainly appears that some restriction should be put upon the sale of immature specimens by those directly responsible for the management and control of our markets.

An important industry such as this demands, in the opinion of many, the appointment of a Fishery Minister. The subject has already engaged attention, and those concerned should, we venture to suggest, give the matter their heartiest support.

The importance of the request is unquestioned, especially in view of the magnitude of the returns that are available. The Hull Fishing-owners' Association, for example, state that the Hull trade has trebled in the last seventeen years, and in 1907 90,000 tons of fish were landed at that seaport.

The Hull Fleet consists of 450 trawlers, valued at two and a half millions. These boats are manned by 4,250 men, and support 50,000 people.

From the figures here given it is very evident,

is it not? that there are certainly as many fish in the sea as ever came out of it, although around our own shores there may be some lessening of numbers.

No good purpose is served by disguising the fact that some kinds of sea birds commit much havoc among various kinds of fishes, and I have known myself one razorbill (the nearest living relative of the now extinct Great Auk) to have as many as two hundred whitebait in its crop! I have no sympathy, however, with such statements as that made at a meeting of the Belfast Natural History and Philosophical Society, by Mr. J. Brown, F.R.S., who calculated that there were 2,000,000 gulls in the United Kingdom, and that during the herring season each bird destroyed 200 fry per day, or 12,000 during the two months of the season. These, if they had come to maturity, *it is said*, would have been worth £24,000,000. The gentleman named advocated the destruction of the gulls, each of which (so he stated) cost the nation £12 in two months in consequence of their protection by Act of Parliament.

It is almost needless to say that such strong comments as are here set out caused a great stir among those concerned in the welfare of our fish and bird populations, and in several newspapers the controversy 'Gull versus Herring' dragged a somewhat weary length.

It was kept up on the one side mainly by Mr. J. Brown, who seems as anxious as a Russian admiral,

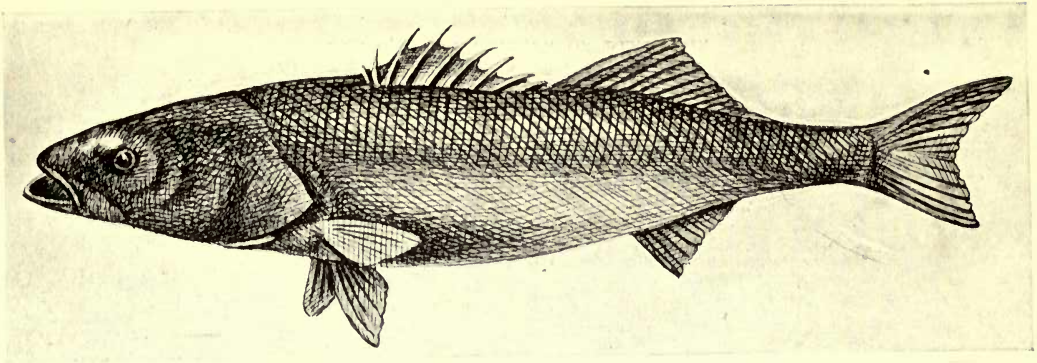


Fig. 15.—Bass or Sea Perch (*Labrax lupus*).



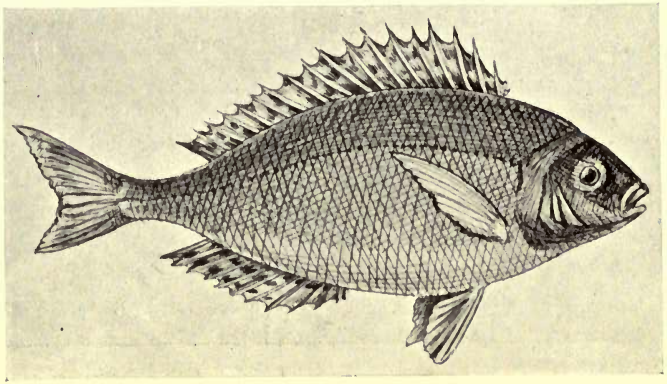


Fig. 16.—Black Sea-bream (*Cantharus lineatus*).

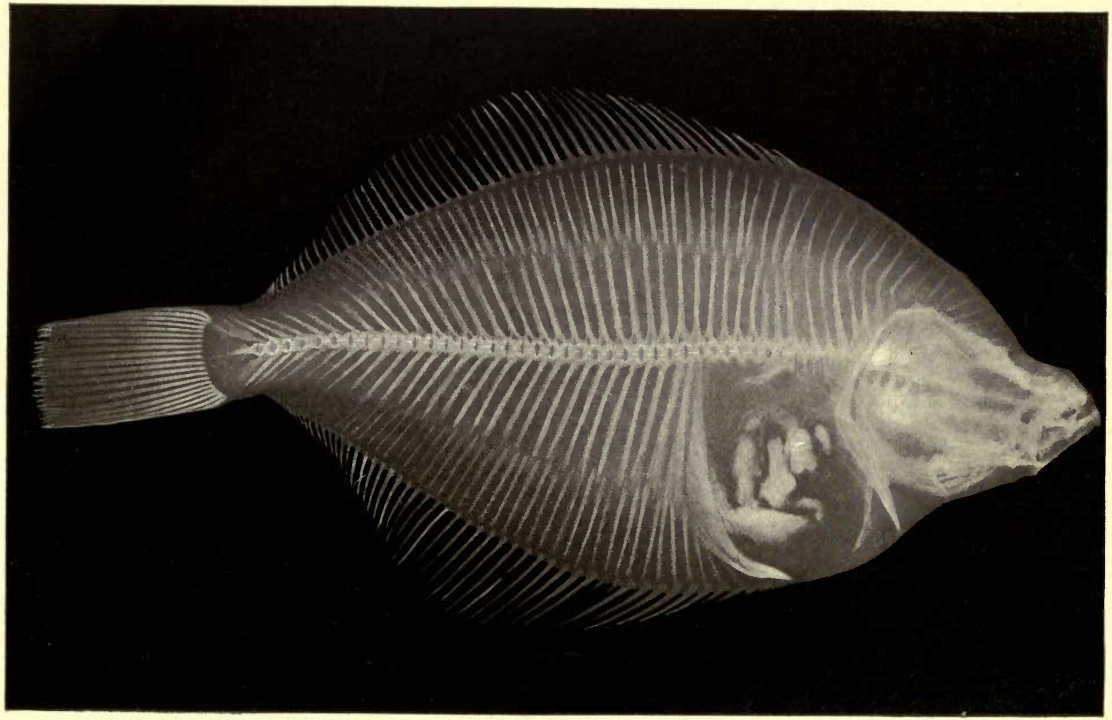


Fig. 17.—Radiograph of Flat-fish.

as pointed out in *Bird Notes and News*, to turn his batteries on anything that appears on the face of the waters. The name 'gull' is taken as including, not only the Common, Herring, and Black-headed gulls, but also the Black-backed (which is not a scheduled bird); and it having been shown by the most surprising figures—and on evidence that can hardly be considered scientific—that gull and man cannot both continue to enjoy a herring diet, the bird is further charged with advancing inland, threatening and devouring poultry, game, eggs, trout, grain, and puppies. The other side of the argument has been maintained by various writers, including Sir Herewald Wake, Mr. F. G. Aflalo, and Mr. A. H. Palmer, in temperate and cogent letters; and, curiously enough, one of the papers containing correspondence on the subject contained also a paragraph recording that '*this has been an unprofitable season for the Haddingtonshire fishermen; as many as a thousand crates of herrings have been thrown away on one day for want of buyers.*'

It does not come within our province to discuss the matter, but it is important that in a book devoted to the sea and seashore some reference should be made to the commercial and economic aspects of the story.

Although the title of our chapter will somewhat belie its name if mention is made of rare, or uncommon, fishes, it is worth noticing how stragglers to our shores

are cast up or captured from time to time. My friend Mr. W. J. Clarke of Scarborough, for instance, tells me that on October 6, 1907, he caught an interesting fish at Filey Brig, in Yorkshire. It was the Atherine. There is only one doubtful record for Bridlington in 1844 not authenticated, and Mr. Clarke is of opinion that this is the first genuine record for Yorkshire, and one of a very few for the east coast of England. He has the fish preserved, a most interesting memento of a rare and unexpected capture at the far-famed Brig of Filey, near which, as I have already told you, the porpoise illustrated in Fig. 11 was obtained. Curiously enough, the atherine is a common fish on some parts of our south coast, but rare indeed elsewhere.

The Perches and Sea-breams form the first fish family on the British list with which we have to treat, and this introduces us at once to the Bass. *Labrax lupus* is the Latin name for this splendid fish, and there is an air of romance about these two Latin words which is decidedly wanting in the peculiar generic and specific Latin names of many other wild folk. Fancy, for example, one of the poor little Dab-fish being known as *Hippoglossoides limandoides*!

As we have a fresh-water representative of the Perch family (and what tales I could tell of hours spent as an angler among these splendid sport-giving fish!) known as the Perch, and the bass belongs to the same high-

spirited group, the latter is often called the Sea Perch. Indeed, this species is a marine form of perch, but also tenants brackish and fresh water. In like manner the fresh-water perch has been caught far out at sea! The Latin name for the latter is *Perca fluviatilis.*

The bass attains a length of a couple of feet, and affords rare sport to sea anglers. I have seen these fine fish caught off the South Coast up to several pounds in weight, and an interesting time may be spent on our pier-heads among the patient disciples of dear old Izaak Walton. What a cosmopolitan assortment of denizens of the deep are collected together by these marine fishermen! It is not with rod and line, however, that our friend *Labrax lupus* is mostly taken. I have a sort of keen regard for the Latin name of this fish, and the reader must forgive me for quoting it again. It is caught, for the most part, in trammels and crab-pots. This is a gregarious fish, both when young and also adult, and spawns in July. As will be observed from Fig. 15, this species possesses the well-known dorsal fins of the fresh-water perch, but the coloration of the body is very different. That of the bass is dark green along the back, and silver underneath. The young —which go about in large shoals—are considerably spotted. Beyond feeding on various small fish, this species does not disdain offal, and indeed is often caught in lobster-pots that have been baited with such

tempting morsels as a dead rabbit or dead horse! I wonder if the reader will order bass for dinner after this.

Coming to the Sea-bream, we recognize at once a smaller species than the last-mentioned. Whereas the bass attains a weight of twenty pounds, the bream grows only to a weight of five or six pounds. This is a rock- or reef-loving fish, but is found all round our shores. It comes shorewards during summer, breeding in the autumn. It is bright red in colour, and there is a prominent black spot upon the shoulder of the adult. The young of this species are known as 'chad,' but when they become more fully grown they are called 'ballard.' The sea-breams of the world embrace no less than two hundred species; some are herbivorous, others are carnivorous. Fig. 16 shows the general appearance of the Black sea-bream (*Cantharus lineatus*).

Every one knows the Mackerel by sight and taste, but few are acquainted with its life-history. The members of the mackerel family are elegant in form and often in colour. Our own British species is a beautiful fish, and is one of the most abundant and familiar in our seas. Among this family, too, are to be numbered the swiftest of the inhabitants of the sea. Whilst some possess migratory habits—like birds—there are others which are characterized by their wide distribution. The Tunnies (large members of the mackerel family)

are the only fish known to be warm-blooded. The deep bands that run down the sides of our common mackerel (*Scomber scomber*), the exquisite blue-silver colours, the large, deeply forked tail, the delightful symmetry, the extensive migrations that are undertaken, and its use as food, are features all worthy of note. This species is illustrated in our third coloured plate, Fig. 3. These are powerful and rapid swimmers, and when hooked rush madly to free themselves. Their food is made up of the fry of herrings and other tenants of the deep, as also of medusae (which wonderful form of life we shall figure in Chapter IX.), small crustaceans, &c. During the summer months the mackerel feeds in shoals on the surface, but as the autumn comes along the shoals are disbanded, and the fish goes to the bottom to pursue its operations.

Not very distantly related to the last-named, a most beautiful fish may here be mentioned in the person of the 'Dolphin' (*Coryphaena*). The insertion of the Latin name of the genus is important because, as will be observed from a previous page, we possess an entirely different animal known as the 'Dolphin,' and which is not a fish at all. Although this *Coryphaena* does not come within the scope of our own sea fauna (excepting as a rare straggler), it is such an interesting and handsome fish that it deserves recognition in our story.

Seen under the best conditions the dolphin fish is really beautiful. As he careers through the water his colour changes, and on a sunlit day, when the sea is a dead calm, it is one of the most beautiful sights in the fairyland of living things to gaze upon him. As he flashes swiftly by one catches just a glimpse of exquisite iridescent tints difficult to describe in cold print. It reminds one of the kingfisher, when that feathered jewel dashes, meteor-like, down stream, and the observer stands spellbound. Its body bears upon it small scales, and these become larger near the head, and these again are covered with fine skin. It has a long dorsal fin, which runs almost along the whole of the back, and this appendage is strictly in keeping with the dolphin's elegant and magnificent appearance. It is of a beautiful golden colour, and when the creature is taking a prodigious leap out of the water, with fin held erect, it is seen to glow with burnished brightness.

This is a speedy creature of the sea, and its shape admirably fits it to propel itself through the water with dexterity. It is a surface-lover, and those who have had the good fortune to watch a school of young dolphins following a ship have spoken with enthusiasm of the entertainment afforded by the antics of these wonderful inhabitants of the sea. When food is scarce aboard, a nicely cooked portion from a succulent dolphin

is said to be such excellent eating that our friend the cod is left far in the rear!

After treating of the Grey Mullet, the next species upon our list, we shall make the acquaintance of a number of members of the Cod family, known by name and sight to almost every reader of this book. First let us deal with the Grey mullet. This is a valuable fish for food, and has a remarkably wide range, from Scandinavia to the Cape of Good Hope. It is also known as the Thin-lipped mullet, another species common in British waters being called the Lesser Grey, or Thick-lipped mullet. The first species bears the Latin name of *Mugil capito*, and the second that of *Mugil chelo*. Various organic matter is eaten—this species not possessing any teeth—and the Grey mullet visits some of our fresh-water rivers. It is a silvery fish, banded with darker markings. The lustre which the living fish bears disappears at death. It attains a length of thirty-six inches, and is one of the most wary denizens of the deep.

Passing over the Sticklebacks and the Wrasses we reach the Cod family, which afford good food for our tables. As will be observed from Fig. 1 in Plate III., the cod possesses a 'beard,' or fleshy barbel, on the lower jaw, but this is not always present. The *Gadidae* —to which the cod owes allegiance—are carnivorous fishes, and many of them inhabit the deepest parts of

the ocean. The cod is the largest of them all, and attains a length of four feet and a weight of one hundred pounds. In colour it is greenish-brown, with a distinct white lateral line. The head is long, and the upper jaw —as our illustration shows—is longer than the lower one. The young are known as codlings. They are yellower in colour, and spotted. This is a ground-feeding species—like the fresh-water gudgeon—and the barbel situated upon the lower jaw aids the fish in its feeding exploits by enabling it to locate and examine, as it were, the various crustaceans upon which it feeds.

The Haddock is indeed the poor man's friend, only exceeded in popularity, perhaps, by the ubiquitous 'bloater.' The reader may perchance feel some surprise when told that the haddock is a near relative of the cod, yet such is the case. The former claims kinship with the same family as the latter, and possesses—although in a less prominent form—the barbel upon the lower jaw. When cured, however, this fish is so turned inside-out, as it were, that it is difficult to recognize it as the fish seen in the water. It has a lateral line running along its body like the cod, but it is black instead of white. There is also a conspicuous blotch of black on each side of the haddock's body. This, as is well known, is a smaller species than the one last under review, and although specimens have been obtained from Northern seas of a phenomenal

weight, it rarely exceeds twenty pounds; about five pounds is a fair average. Various kinds of shellfish are partaken of by this fish. It appears to keep close to the shore during the winter season, the spawning time being in the spring.

First cousin to the haddock, the Pout is a very common inhabitant of the seas surrounding our island home. This species has a number of local names, among which may be mentioned those of bib, whiting, pout, pouting, and blain. Being much less known than our feathered friends, our British fishes do not possess the extraordinary number of local and old-fashioned names as the birds. Nevertheless, some of them are very curious, such as Old-wife fish, Jago's Goldsinny, Gattorugine, Gemmeous, Dragonet, Boar Fish, or Cuckoo, John Dory, Pelamid, Bonito, Piper, Father Lasher, Dentex, Witch, Thickback, Fluke, Top-knot, Whiff, &c.

To continue our story of the pout: this is brown in colour, deeply banded, and white underneath. It has a deep body and the characteristic barbel on the lower jaw. Where there are rocks you may search for this interesting member of the cod family. Mr. Aflalo states that it is also fond of the neighbourhood of sunken wrecks, and that it wanders little from place to place.

The Silver Whiting is of great service as a food-fish, but from the specimens that have been placed

before me at London restaurants, I can testify to the statement that it rapidly deteriorates. It does not possess the barbel of the foregoing species, but it has the lateral black line as exhibited in the haddock. The body is silvery, as its name implies, and it has a spot on the pectoral fin. The large mouth is armed with numerous small and sharp teeth, and the food is made up of crustaceans, worms, sand-eels, &c. It dearly loves sandy tracks of ocean, and shifts its quarters much more than the pout. It attains a weight of about four pounds, and a length of twenty inches. The average weight, however, is much less than that mentioned. The spawning season is early summer.

The Pollack is a handsome fish, but being of little use as food it is not often on view at the fishmonger's. Its flesh deteriorates very quickly, and it is not therefore in great request. It does not possess a barbel; it is green in colour, and attains a weight of twenty-five pounds. It seeks the seclusion of some dark rock-pool during the daytime, its feeding operations being confined to early morning and evening. Like many other inhabitants of the sea, the pollack—or 'lythe,' as he is sometimes called—seems to possess a keen desire to enjoy life, and its gambols are fascinating.

The Hake and the Ling are the two remaining representatives of the cod family with which we are to treat before considering the various kinds of flat-fish. The

hake only has two dorsal fins. The body is grey above and silvery below. It possesses large and rough scales, and large teeth. It attains a weight of over twenty pounds and a length of four feet. It is often caught in the pilchard-nets, and these fish (pilchards) are much sought after by the hake, as also the shoals of herrings and mackerel. Owing to this habit, and its nocturnal wanderings, great damage is often done to the fisherman's nets.

The Ling (it is curious to notice that we have a wild plant and also a fish known by this name, and a Grayling fish and a Grayling butterfly) is a much larger species than the hake, attaining a weight of more than one hundred pounds and a length of six feet. It is dark grey on the back and light-coloured upon the head and belly. It is more elongate in form than the last-mentioned species, and is a ground-dweller, feeding upon various kinds of small fish found in the deeper parts of the sea. The smooth skin, soft and narrow fins, and projecting upper jaw are also distinguishing features of this, the last member of the cod family.

This brings us to the Flat-fish, with several of which we may now treat, and most of which are well known because of the excellent and nutritious food that their bodies supply. Our radiograph of a flat-fish (Fig. 17) will afford the reader a good general idea of the form and structure of these interesting sea fish. The photo-

graph very clearly depicts the anatomy of a flat-fish, the vertebra, or backbone, exhibiting, when closely examined, pattern-work of a remarkable kind. The wonderful bones which radiate from this central structure are also well defined. These flat-fish are not only valuable commercially, but are exceedingly interesting, because they differ from the rest of our sea fish in having a compressed form, a different coloration on either side, and a twisted head, in which the eyes are both on the same side. If one of these flat-fish be compared with what we may term a round-fish, it will be observed that what on first sight might be taken for the back, is, as a matter of fact, one of its sides! Again, the edges of a flat-fish are in reality its back and belly! This rule holds good generally, but there are exceptions among them which need not be detailed. These fish, then, have small mouths as a rule, and feed upon soft food. This latter they obtain from the sand by means of suction. They bury their bodies in the sand, and there dwell for the most part; sometimes, however, they will leave their retreats and come to the surface of the water. There are more females than males, and the former are the larger in point of size.

This is a large group of fishes, embracing some 500 species. These are mostly marine, a few kinds being confined to the fresh waters of South America and the Malay Archipelago. They are distributed from

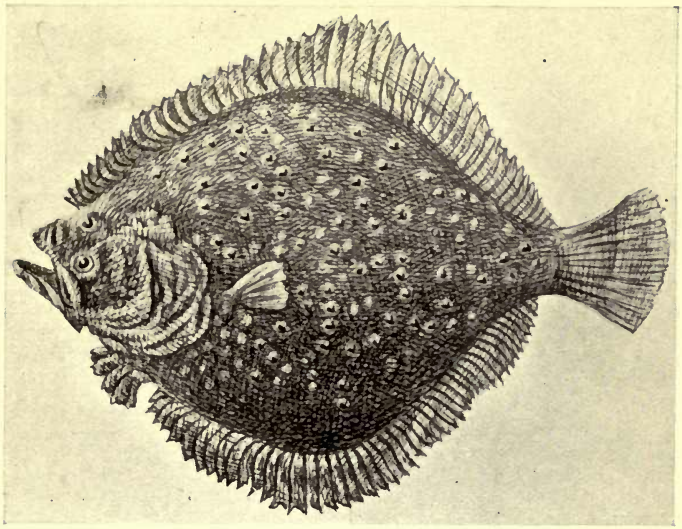


Fig. 18.—Turbot (*Rhombus maximus*).

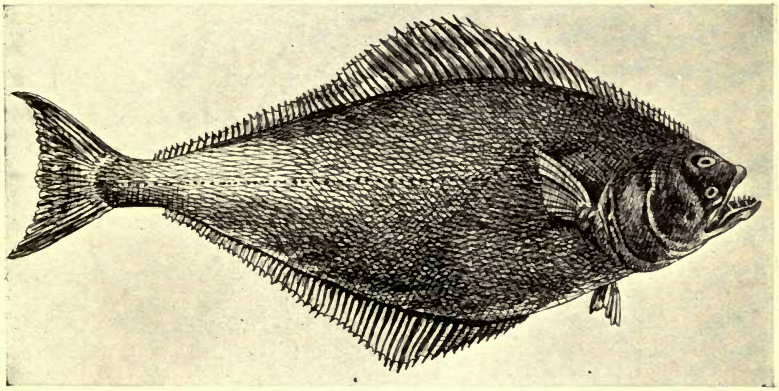


Fig. 19.—Halibut (*Hippoglossus vulgaris*).

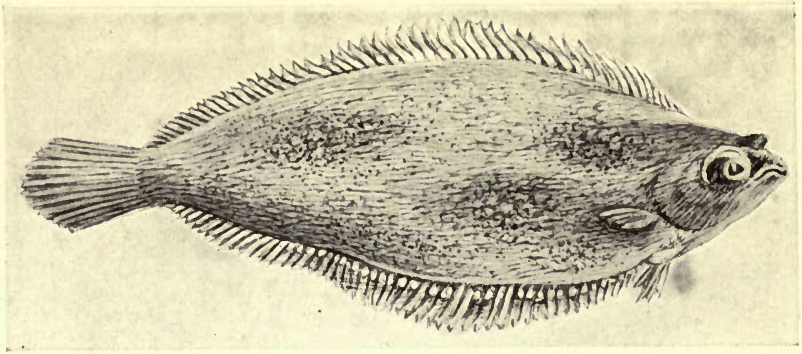


Fig. 20.—Common Sole (*Solea vulgaris*).



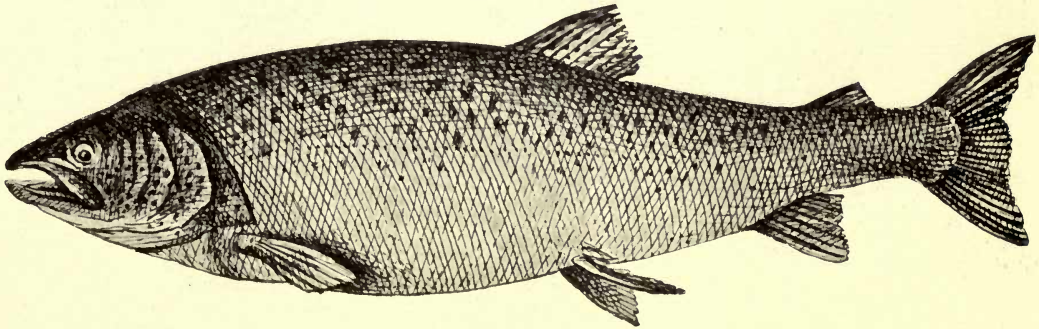


Fig. 21.—Salmon Trout (*Salmo trutta*).

the Arctic Circle to the southern coast of the Southern Hemisphere. Many species are found inhabiting great depths of water, one in particular occurring at 955 fathoms.

We may next consider the claims of the Turbot for inclusion in our story. This fish is most abundant in the English Channel. Unlike the halibut, next to be considered, it has the eyes on the left side of the head instead of on the right. The turbot resembles its near relative the brill in many particulars, but has a broader body; the tubercles are scattered over the surface, and these take the place of scales. These tubercles are only present on the coloured side of the body. An illustration of the turbot is given in Fig. 18. A weight of over twenty pounds is attained by this fish, and a length of three feet. The brill is a foot shorter. The colour of the turbot is brown, or stone-grey. Spawning takes place during the summer, and at that season of the year this species appears to keep close to the shore. The food consists of small fishes. In the young of flat-fish it is interesting to observe that before they acquire the habit of lying on one side both sides are similarly coloured. The adult fish, however, have the upper surface somewhat like that of the bed of the ocean itself, whilst the underside is pure white. Beyond this, these fish have the power of changing their colour so as to resemble the environment they

frequent. So great is this protective coloration in some instances—the sole, for example—that the fish is most difficult to locate, indeed at times it is invisible.

The Halibut is the largest representative of the flat-fish family, and I can personally testify as to its excellence for the table. It cannot, however, be compared with the palatable qualities of the turbot. Unlike the last-named, this fish has the eyes and colour on the right side of the body. It frequents deep water, and attains a considerable size, specimens measuring as much as twenty feet, and weighing one hundred pounds, having been recorded. It has a smooth skin, and is dark brown on the right side. This species has a wide distribution; its large mouth is furnished with pointed teeth, and the food is made up of various fish, crustaceans, and molluscs. It is illustrated in Fig. 19.

The Plaice is accorded a position (I had almost written place!) in our third coloured plate, Fig. 5. This is one of our commonest British flat-fishes, and is to be distinguished by means of the orange or red spots on the upper surface of the body.

It has small scales, but these are so embedded that the fish feels quite smooth. It attains a length of eighteen inches or more, and a weight of over ten pounds. An average fish, however, turns the scale at about a couple of pounds. In front of the large

ventral fin there is a spine. Both the plaice and the dab possess this distinguishing feature. Right across the body there is a straight line, and upon the head a bony ridge is present. It has strong, blunt teeth, and these enable the fish to crush various kinds of shellfish. It also feeds on worms. The large eggs are laid early in the year, and these float at the surface of the water. They are to be numbered among the largest eggs of fish known. 'The young, as those of all the flat-fish,' writes Mr. Aflalo, 'swim in their earliest stage like those of "round" fish, the eyes being on either side of the head, until, in the course of a few weeks, the left eye works round or through the margin of the head, taking its place beside the other, and leaving only a minute black dot to indicate its former position. By this time the little fish has taken to the bottom, and swims on its side, the twist in the head, which brings the dorsal fin along the line of the face, being simultaneous.'

The little Dab is rough-skinned. It is light brown with dark spots. This is a very common British species, and is not confined to the sea, for it inhabits brackish waters situate around our coast-line. The spawning season is April or May. Holiday-makers at our seaside resorts—that is, those who delight in going out to sea to fish—often come ashore with a number of these small flat-fish, and as I have watched these anglers, I

have often been amused at the smallness of the fish captured. Even if twenty or thirty of these little dabs are strung together the 'catch' strikes one as very poor indeed. But I am perhaps somewhat prejudiced, never having had any desire to become a sea-angler; beyond which, I have been a keen devotee of fresh-water angling in private waters, and have had remarkable successes. Without spinning any sensational fishing-yarns, among my records are no less than two and a quarter hundredweight of bream, tench, and rudd, which were caught by three rods in the course of a couple of hours after a storm! On another occasion my father and I caught thirteen dozen large rudd in one day at a strictly preserved lake not a great distance from London. Fishing for trout in a very shallow stream in Hertfordshire on another occasion my brother and I bagged two dozen trout in one day, which turned the scale at an average weight of over two pounds each, beside a number of perch, roach, dace, and jack. Although I fish no longer, having, I am afraid, merged into what one might term a rabid humanitarian, I can imagine the catching of these little fish affords an amount of innocent pleasure and delight to those who annually sojourn by the silver sea, so that we ought not perhaps in common fairness to poke fun at their expense! I must candidly admit that the only occasion upon which I did consent to try a little sea fishing, the

gentle swaying of the boat (the sea was as calm as the proverbial millpond) upset me so much that I had to be rowed ashore! But we must now resume our story.

The next common sea fish on our list is the Flounder. This species also is smaller than the plaice, and does not possess its characteristic red spots. Unlike other flat-fishes, the flounder—or fluke, as it is sometimes called—has a decided preference for the mouths of rivers. Indeed, it is asserted—and with truth—that this sea fish has so far changed its habits as to have become partially an inhabitant of fresh water. It spawns in March or April, but invariably goes down to the sea to perform this important function. The colouring of the species varies according to the situation frequented. Generally speaking, however, it is dark brown with darker mottlings. It possesses tubercles; the eyes are placed in close proximity to one another; the teeth are cone-shaped, and mostly developed on the left side. The food consists for the most part of worms and molluscs.

Before leaving these interesting flat-fish, we must accord a place to the two Soles, known as the Common sole and Lemon sole respectively. The first-named is a smooth, oval-shaped fish of a yellow colour with darker markings, and is shown in Fig. 20. Generally, the eyes will be found to be present upon the right

side. The spawning season varies a good deal around our coast. In some parts of our island it commences as early as April, and in others as late as June and July. This is a common British fish. Its food consists of crustaceans.

The Common sole (*Solea vulgaris*) belongs to a different genus from the Lemon species. This is a lover of shallow water, and the food is more diverse in character, consisting of crabs, shrimps, and worms. Mr. Pycraft states that the sole appears to locate its food by means of smell, gliding over the bed of the ocean and tapping with the lower side of its head, which is provided with very sensitive organs of touch in the shape of filaments at the edge of the snout. It is a nocturnal fish, secreting its body in the sand during the daytime, and it restricts its feeding exploits to the silent watches of the night. *Solea vulgaris* is very deep brown, but white on the left side. The average length appears to be from twelve to eighteen inches, and the maximum weight about nine pounds.

We now come to the Eels, two members of which family are entitled to a place in our story—namely, the Common eel of fresh waters (which descends, however, to the sea in autumn for the purpose of spawning) and the Conger. The Latin names are *Anguilla vulgaris* and *Conger vulgaris* respectively. I remember once catching two female Common eels

within five minutes of one another, which were as thick as one's wrist, and both of which measured exactly three feet long. Both were females, and it is important this should be borne in mind, because the male not only rarely exceeds a length of twenty inches, but, as will be shown later, is very infrequently met with at any distance from the sea. It does not come within our province to delineate in detail the character of this river eel, but we may briefly consider its connexion with the sea. During the autumn the females of this species descend to the sea for the purpose of spawning, and it is generally recognized that after this process has taken place the adult fish die, as they have never been known to ascend rivers again. Towards the end of the winter the young eels—called Elvers—change their habitat, and begin to ascend our fresh waters. At this time they only measure from two to five inches, and are almost transparent. The number of these young eels which leave the sea for their new quarters is enormous. A few years ago over three tons were caught in one day, and a calculation has been made by which it was ascertained that more than 14,000 are required to turn the scale at one pound.

The migration fever seems to be particularly strong in these young eels, for they have been observed to climb stone-banks, ascend the flood-gates of locks, and even to cross damp fields in their desire to find

a congenial home in fresh water. I have noticed repeatedly when I have caught river eels how capable they are of travelling over land, and very often have lost my captures when, instead of securely putting them in my fish-basket, I have placed them on the grass by the river-side. In some manner or other the crafty creatures have managed to wriggle back into the water, and who amongst us would say that they did not deserve freedom after such clever manœuvres?

Their tenacity is another remarkable characteristic. When walking or driving home from my fishing excursions I have frequently known eels to crawl out of the small opening in my fish-basket, and when we have caught a number of them and driven homewards in a low trap, I have known them to be on the floor of the cart, on the seats, among the rugs and cushions and elsewhere!

When it is remembered that these fish had already been out of the water for several hours, and that even after we had arrived at our destination they were still very much alive (and indeed were quite active the next morning), their extraordinary tenacity will be apparent.

When propelling their bodies through the water from side to side eels present a most curious appearance, and a large fish requires very careful handling on the part of the angler to ensure a safe landing. These river and sea folk love the mud. Here they burrow

and spend most of their time. In thundery weather they seem to come forth from their hiding-places more than at other times, and anglers then say that 'the eels are *on the run*.' They grow slowly, and even after four or five years the weight attained is only about five or six pounds. The males rarely ascend rivers like the females. The former resort mostly to the brackish water of river-mouths, and go down to the sea to feed. The females distribute themselves in rivers, ponds, lakes, and other waters, and here it is supposed they remain until maturity, when—through some wonderful influence unknown to us—they migrate towards the sea for the purpose of spawning, which, as has been mentioned, means certain death!

Plate III., Fig. 2, shows a good representation of the Conger eel, which is very much larger than its near relative whose biography we have just considered. The Conger is exclusively a marine species. Whilst also the former species possesses small scales (embedded in the skin), the latter does not possess any scales whatever. The Conger attains a weight of over one hundred pounds, and a length of over eight feet. It is a darkish monster on the upper parts, but white below. Our coloured illustration clearly shows the large head and eyes, the long upper jaw, the continuous dorsal fin, and other characteristics. The female is larger than the male, beyond which she may be identified by the

possession of a more pointed snout. She also lacks the distinct coloration of her mate upon the lower portions of her body. This fine eel has a wide distribution in our seas, but is stated to be most common off the West Coast owing to the presence of a more rocky habitat. It feeds principally at night, and the food is made up to a great extent of lobsters, cuttlefish, and rockling.

Much mystery still enshrouds the full life-history of this species. But a good deal of attention is now being paid to this important phase of its life, and it is reasonable to suppose that in the near future more original and detailed information will be forthcoming concerning it. It is believed that the eggs are laid during the summer, and that after the initial spawning-time both sexes die. It is remarkable to notice the enormous number of eggs laid by, and found in the bodies of, fishes. This will be more apparent when it is stated that from the body of one female Conger more than eight millions of eggs have been obtained!

In regard to the early life-histories of the two British eels—the Common eel and the Conger—it is interesting to observe that the eggs hatch out into larvae. The very early stages are as yet unknown, and when we first make their acquaintance they appear in the form of transparent flattened creatures. For a long time these larvae have been known to naturalists under the

name of *Leptocephalus*. The larva of the Common eel is known as *Leptocephalus brevirostris*, and that of the Conger eel as *Leptocephalus morrisii*. The former is characterized by the shortness of the snout, but is a wonderful little creature when structurally considered. That this remarkable larva eventually assumes a cylindrical form and grows into an eel has been proved by the work accomplished by the Italian naturalists Grassia and Calandruccio. These naturalists carried out a series of observations on the Sicilian coast in 1891-92, and, as a result, we are to-day far better acquainted with the main features of the eel's early life-history than previously.

We now pass to the biography of the Herring. The family is very important so far as concerns those of its members which are of such commercial value. In our own country the species claiming kinship with this family are small fishes, and cannot be compared with the Tarpon of Mexico and other large representatives found in Australian waters.

Dr. Günther was the first to show that the so-called 'whitebait' is in reality chiefly composed of the fry of herrings, and these fry have a distinct liking for brackish water. The anchovy and the pilchard, however (two near relatives), have no predilection for such a habitat, and seldom, if ever, resort to it. There are exceptions, it is said, to every rule, and this holds

good in regard to the eggs of the herring; for, unlike most British marine fishes sought after for food, the eggs are heavy and adhesive. They stick firmly to stones and other objects situated permanently at the bed of the ocean, whilst those of the sprat and pilchard float on the surface. These eggs are largely eaten by other ground-fish. The larvae of the herring are long, slender, and transparent. Our chief fishing-station for the herring is the east coast of Scotland. The fish attains a length of about seventeen inches, and the male is believed to be larger in size and more numerous than the female.

Being a surface-feeder, the herring is mostly captured by means of drift-nets, and it is a very interesting sight to locate a company of herring-gulls busily engaged catching fish with unerring aim and dispatch when the herrings first make their appearance. They change their quarters in search of food or warmth, and very often the gulls are the first to proclaim to the fishermen that the fishes are on the move, and that it is time for them to cast off from the shore and let down their nets among the shoal. It is owing to this bird's fondness for the herring that it has acquired the first part of its English name. We shall consider this bird more fully in a subsequent chapter. This fish possesses large thin scales and a keeled body; it has no lateral line. Its teeth are small, and various floating matter con-

Fig. 22.—A Fresh-water Haunt of the Salmon.

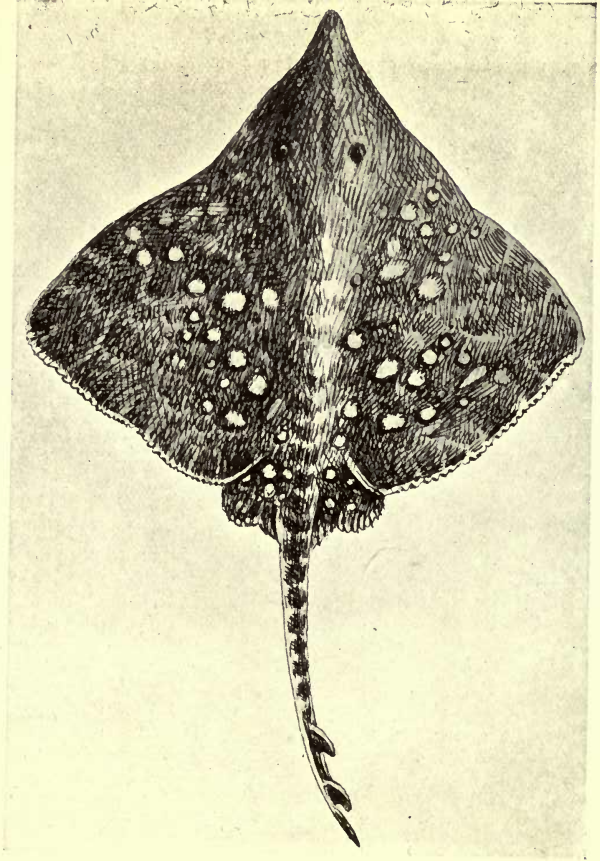


Fig. 23.—Skate.

Fig. 24.—Sea Horse.

stitutes the food. Mr. Aflalo states that 'the water is filtered through gill-rakes, the function of which is not unlike that of the baleen in whales' (already referred to in our first chapter), 'and this mode of feeding is characteristic of the family.'

This is a particularly beautiful fish when freshly caught, and before it has been 'cured' almost out of recognition into the familiar 'red herring,' 'kipper,' and 'bloater.'

Like the last-named, the Sprat is, to a great extent, a fish that affords good food for the poor. Besides the fry of herrings, the so-called 'whitebait' is also made up of the fry of the sprat and other fishes. The young of both these species are fond of making their way into sheltered estuaries.

As is the case with the majority of marine fishes, this species, the pilchard, and the anchovy lay floating eggs; and the fact that they are surface-feeders in shoals also accounts for the large and comparatively easy captures that are made, and the cheap price at which they are sold in our fish-markets. Unlike the herring, the sprat is destitute of teeth. It is grey and silver in colour, and always appeals to me as a beautiful little fish. It resorts to two spawning seasons. That is to say, those individuals resorting to our south-west coast spawn between January and April, and those on the Scottish coast from April to July. When very young, even before they can be used as 'whitebait,'

the sprat is much sought after as food by various birds such as gulls. Our friend the mackerel is also very fond of the young sprat when in its early stage known as the 'Brit.'

Many people eat 'sardines,' but few are acquainted with the fact that these fish are merely young pilchards! The question has been asked me many times at my lectures and elsewhere as to whether the sardine is a distinct species of fish, and an unhesitating 'No' has invariably been given. On the west coast of France a very extensive and valuable fishery is carried on, as well as off the coast of north-west Spain. It is stated on good authority that the value of the sardines caught by the French each year totals something like £400,000, and that our own imports of preserved fish (mostly these fish) from France are valued at over £300,000 per annum at a low estimate. In general appearance the pilchard is akin to the herring. It has, however, a rounder body, large scales, small teeth, a keel-edged belly, and other salient distinguishing features. The colour above is deep green and silver underneath. The spawning season is July and August, but the precise movements of this important commercial fish are not yet well understood. In some seasons its scarcity results in much hardship to those who rely upon it as a commercial asset. In Cornwall, it should be stated, the pilchard fishery is a very important industry;

but, although operations are chiefly directed to it in the south-west of our island, it is found inhabiting other parts of our coast.

Before coming to the Salmon, we may briefly consider the Anchovy. This is a useful species, and in foreign seas a thriving industry is carried on, especially by the Dutch. It is very abundant in the Mediterranean and elsewhere, but is nevertheless native to our own seas. It has not, however, been observed to spawn in the English Channel, although its eggs have been obtained off the Lancashire coast. This is a slender little fish, and the smallest member of its useful family. Green and silver are the predominating colours. Distinguishing characteristics that may be mentioned as a means of identifying the anchovy are the projecting snout and the deep cleft of the mouth. As a matter of fact, this interesting little fish reminds one somewhat of a miniature shark. It is in the matter of various flavourings that this creature is best known to us, such as anchovy sauce.

We now reach the handsome Salmon, a very good example of which is portrayed in Fig. 21. The species figured is *Salmo trutta*, the Salmon Trout; the true Salmon is known in Latin as *Salmo salar*. It is with the latter, then, that we are mostly concerned, but a few general remarks upon this fine family of fishes will not be out of place. The various distinct species and

varieties of the genus *Salmonidae* are characterized by their beauty, economical value, and gameness, and these features entitle it to be styled 'King of Fishes,' as the eagle is the 'King of Birds.' As will be apparent from the strictly scientific order followed in the present chapter, the salmon is classified towards the end of the British Pisces, and 'comes undeniably low in the scale,' as Mr. Aflalo points out. That it and its relatives are game fighters, and afford an amount of sport, all those who go a-fishing will readily agree; and even if we only consider the claims of our common river trout (*Salmo fario*) in this respect, I can personally testify as to its fine qualities as a fighter, especially when caught in a running stream!

Remarkable variety exists in the coloration of these river trout, which are near relatives of the salmon, and belong to the same family. Whilst I have caught specimens spotted in a truly beautiful manner and symmetrical in shape, I have landed many others which exhibited strong tendencies towards melanism, with bulldog-like heads and the reverse of comeliness. Others, again, have fallen a prey to my luscious lob-worm (fly-fishermen will, I hope, never read these lines!) which appeared to be a sort of mongrel breed between the two varieties named.

Artificial transportation from one sheet of water to another, the introduction of trout fry from foreign

countries, and other things, have each and all tended towards this very apparent divergence in the form and colouring of the trout of our rivers. This fact, and also the further fact that various members of the *Salmonidae* pass from fresh water into the sea, and vice versa, has made it an almost impossible task in many instances to determine accurately the exact species of any given individual. Indeed many so-called species have, as a consequence, been reduced to the rank of local varieties. There seems to be a mania to-day among some wealthy people to depopulate the waters upon their estates of all the coarse fish, such as pike, perch, roach, rudd, tench, carp, bream, and so on, and to turn into them so-called lake and other trout. That members of the *Salmonidae* (be they species or varieties) afford most delightful sport I have already testified; but I consider it fallacious to turn out the interesting coarse fish above mentioned, and to replace them with trout from foreign countries, which in many instances fail to do at all well in their artificial homes. It is much the same with other animals. I have observed a herd of red and fallow deer in an English park, and admired the whole setting of the charming scene—green grass, tall stately oak- and beech-trees, indigenous animals, each in thorough keeping with the other. I have seen, on the other hand, such animals as marmots, kangaroos, pelicans, rheas, &c., in an English park, and they looked strangely out

of their element and out of keeping with the place and the surroundings. Many a sheet of water where in boyhood I used to angle, as my father and grandfather did before me, and which once teemed with coarse fish, shelters them no longer. Not that it is any loss to me, for I long since ceased to angle. To-day those lakes and ponds, hitherto fringed with English rushes and wild flowers in profusion, and once peopled with indigenous fishes delightful to watch, have been denuded of much of their charm. One can hardly recognize the locality, so changed it seems. The water is there, but foreign plants and trees occupy the places where British forms once flourished. One may no longer espy a crafty pike hiding beneath the weeds, or a school of dace or bream sunning themselves near the surface of the water. These and other denizens have been replaced by some kind of trout, good, bad, and indifferent; the lake bears upon it various kinds of water-lilies which are very beautiful, but look strangely out of place and are more suitable for a hot-house. You may stand all day looking for a single fish upon the move, and hie away disappointed. I love my country, and am one of those old-fashioned individuals possessing a great respect for old-time associations and scenes, and I unhesitatingly protest against this ruthless extermination of indigenous plants and animals to satisfy the dilettante tastes of American millionaires and others. All this arose through

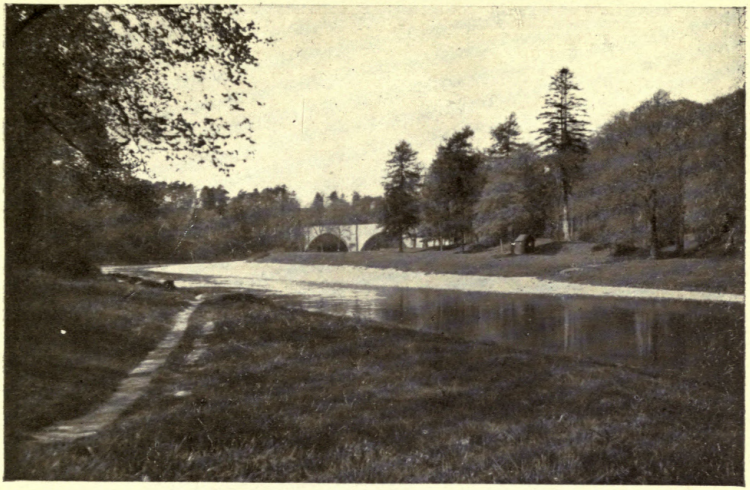


Fig. 25.—On the Tweed.

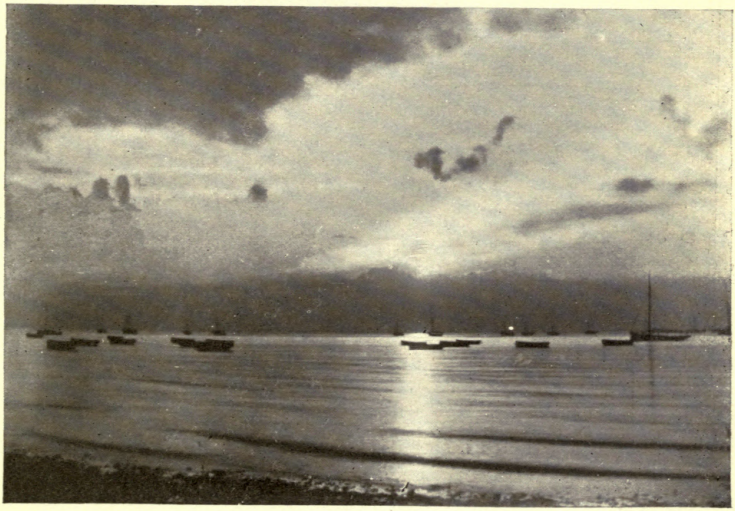


Fig. 26.—Fishing-boats at Rest.

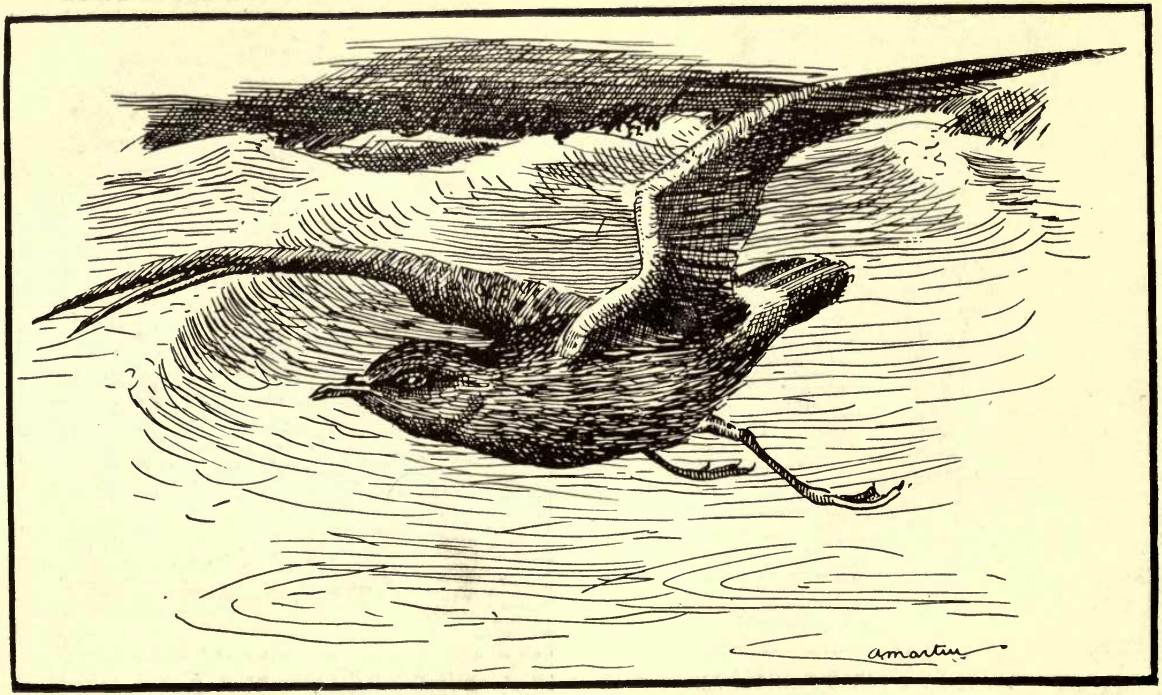


Fig. 27.—The Stormy Petrel, better known as Mother Carey's Chicken.

writing about the salmon and the *Salmonidae* in general, and alas, how my pen has wandered! Now let us pass on.

The salmon, then, is what is known as an anadromous fish, repairing regularly to fresh water for spawning purposes, and thus acting in an entirely reverse way to the river eel in this respect. The Severn, the Tay, the Shannon, the Dee, the Tweed, the Hampshire Avon, and other rivers have become justly famous for their salmon. The movements of the salmon are very remarkable when one comes to consider them in detail. For example, it is stated on authority that the fish will return from the sea by preference to their native river, and that the females first take the journey, then the old males, and the young salmon last of all.

The spawning season takes place late in the year, and the eggs are deposited among a heap of gravel. One of the most deadly baits wherewith to lure the salmon is roe taken from the body of one of its own kith and kin! When the spawning season is on the males engage in well-organized combats.

We have spoken of the varieties of the river trout. Somewhat similar changes may be noticed in the salmon, for when the fish has resorted to fresh water for some time reddish spots and lines appear, and the beautiful steel-blue colour undergoes a change through the same cause.

The feeding habits are not very well known. Indeed it is thought that when tenanting our fresh waters very little food is partaken of, and this theory is strengthened by the fact that on occasions the salmon may be lured with extraordinary 'baits,' and the fish displays an intense greediness difficult to understand. The average weight is between twenty and forty pounds, but specimens of over sixty pounds have been recorded. A length of four and a half feet is attained.

The Smelt belongs to the salmon family. It is also known as the Sparling. This species resorts to salt water for breeding purposes, and although it often enters rivers, it does not ascend further than that portion coming under tidal influence. On the other hand, Günther says that a small fresh-water form of this species occurs, and is fully acclimatized in lakes which have not now any open communication with the sea. It is a small fish, attaining a length of about twelve inches. It is light green in colour, silvery below, and a band of the latter is present on the sides. The large mouth bears sharp teeth, and the food is made up of small fishes, insects, &c. Spawning takes place during the spring and early summer, and it is an interesting fact that it exhibits a marked preference for shedding its spawn in stormy weather. Its smell has been compared with that of the violet, the cucumber, and other plants and substances.

An interesting photograph of the very curious Sea Horse is reproduced in Fig. 24. This wonderful little fish—for such it is—swims with the body in a vertical position, as shown in our illustration. The male of most species of *Syngnathidae*—to which the sea horse belongs—takes charge of the eggs, and these are secreted either in a pouch under the tail, in a groove under the tail, or in a groove on the abdomen. The mailed body has upon it grooved ridges, as admirably depicted in the photograph ; whilst the tubular snout and the curved tail are also worthy of examination. Aided by this pointed and prehensile appendage this marvellous little creature is able to attach itself to the stems of weed or other objects as a means of support. The black body is covered with spines, and is dotted and banded with white. It only attains a length of about four inches.

The Common Skate is the first representative of the Rays, with which family we conclude the present portion of our story. An illustration of this fish appears in Fig. 23. The colour is pale grey, and the body is spotted with black ; the under surface, however, is far different, being almost white, but speckled with black. The two spineless dorsal fins are well exhibited on the tail of the specimen figured, as also the rows of tubercles. Closely allied to the sharks, the skate deposits ' purses ' ; but unlike those of the first-named,

these do not possess any tendrils as shown in the illustrations in Chapter I. The largest species of Ray that we possess in this country, or rather in the sea surrounding it, is known as the Sharp-nosed ray. It attains a length of from seven to eight feet, and a weight of 500 lb. Unlike the skates, this fish is spotless white on the under surface, only the edge of the pectoral fin being occasionally shaded with black. Rows of spines are present on the tail and pectoral fin, as also at the back of the eyes.

We must of necessity pass by several species of Rays in our brief survey of this vastly interesting family of fishes, and conclude with succinct biographies of the Painted ray and the Sting ray. The upper surface of the bodies of these fishes closely assimilates with the sandy or gravelly bottom of the ocean, and, this being so, they have little difficulty in successfully luring various small fishes, crustaceans, and other organisms. Strictly speaking, Rays are comparatively sluggish and inactive, but their protective coloration enables them to procure food without much exertion. The Painted ray is also known as the 'Small-eyed ray.' It frequents shallow water, and is a common inhabitant of the English Channel. The name of Painted is somewhat misapplied, as the colour consists generally of some shade of marbled grey on the upper surface dashed with white or yellow. In accordance with the invariable

rule which holds good among all the Rays, the under surface is spotless white.

It is an appropriate ending to our present chapter that the Sting ray (also known as 'Fireflaire') should be numbered among the commonest and most formidable British species we possess. This attains—even in our own seas—a weight of eighty pounds and a length of three and a half feet. It is a great lover of mud, and a characteristic means of identification is the serrated spine situate upon the whip-like tail. Like the tail of the lizard, that of the Sting ray can be replaced if lost by accident or otherwise. Indeed it has been suggested that this weapon may be replaced periodically. Whilst by means of the tail-spine this fish is able to inflict serious wounds, it is not definitely known whether mere laceration is the sole cause, or whether beyond this any poison is employed in addition.

This concludes our chapter devoted to Some Common Sea Fishes, and it is appropriate that this species should be accorded attention lastly, because in the classification of our British fishes it occupies almost the last position, and only one small family succeeds it.

## CHAPTER IV

### SOME BIRDS OF THE OPEN SEA

Our story of the Sea and Seashore would be far from complete if attention were not devoted to some of the feathered population who make their home on and around the sea. For the purpose of distinguishing between those species of birds which mostly resort to the open sea and those that tenant the seashore and its vicinity, we have devoted a separate chapter to each. In the present instance we are concerned with oceanic birds—that is to say, those birds who for the most part pass their time (other than at the nesting season) on the open sea, and do not often come near the shore. If our attention were solely directed to those species of birds who *never* approach the land, excepting at the breeding-season, our list would be a poor one, and would only include the Stormy, Leach's, Wilson's, the Fulmar, and other rarer species of petrels, and the Shearwaters. When we come to extend the list, however, and include those species which pass most of their time on the open sea, a much more presentable list is before us. This is the course which we propose to follow, in spite of

the fact that we shall make the acquaintance of a few kinds of birds in both chapters. In this respect may be mentioned the Guillemot, Puffin, Razorbill, Gannet, Great Black-backed Gull, and Kittiwake Gull.

None of these latter birds, however, are *usually* seen on the coast during the winter, unless driven thither by rough weather, or, curiously enough, by frost. Why frost should affect these pelagic species seems shrouded in mystery, but it certainly does bring them inshore. Can the explanation be, as my friend Mr. W. J. Clarke of Scarborough suggests in a note written to me on this interesting subject, that frost drives the small fish upon which the birds feed down into deep water where the latter cannot get at them ?

We may consider, in the first instance, those of our feathered friends who are, *strictly* speaking, true oceanic birds, and this brings us to that delightful little species the Stormy Petrel. Almost every one has heard of Mother Carey's Chicken (an old-fashioned name accorded to this species of petrel), but few people appear to know the bird by sight. Many to whom I have pointed it out have evinced surprise at its smallness (it is only six inches in length), and marvelled that such a little bird can battle with the sea and face tempestuous storms with so much courage. Fig. 27 conveys a good idea of the general appearance of this remarkable bird when it is flying. The Stormy petrel

is a sombre-clad species, being black on the upper parts with the exception of the tail-coverts, which are white at their bases; white is also present on the edges of the wing coverts. Underneath, the colour is sooty black, as also the bill and feet. This bird only comes to land for the purpose of breeding, and even then its habits are nocturnal, and it is with difficulty that it can be observed.

The name of 'Petrel' has been conferred upon this bird because of the habit it possesses of dropping the feet and paddling when gliding over the surface of the water. This habit gives the bird somewhat the appearance of walking upon the water; and owing to this its name has been associated with the biblical story of the Apostle Peter. As to the name of 'Mother Carey's Chicken,' Mr. W. H. Hudson in his delightful work on *British Birds* writes: 'Mother Carey is supposed to be a kind of ocean witch, a supernatural Mother Shipton, who rides the blast, and who has for attendants and harbingers the little dark-winged petrels, just as the more amiable Mother Venus has her doves.'

Our illustration well displays the sharp-pointed, out-stretched wings, and also the webbed feet. This bird is the smallest possessing the latter. It may be compared in point of size with the cosmopolitan sparrow.

Food is sought with commendable perseverance by this wonderful ocean wanderer, and it often follows in

the wake of a ship with the apparent object of picking up any tit-bits that may be thrown overboard. The bird, on dissection, proves to be very fat and oily. I have known instances where dead birds have been utilized by fishermen in place of candles, the body being lighted at the ventral end! I am told, too, by an eye-witness, that when far out at sea and not a petrel is in sight, if fat from the fry-pan is cast into the water, a number of these birds will be attracted to the spot as if by magic. The food partaken of is of an oily or fatty character, but its exact nature has yet to be determined. When handled, Mother Carey's Chicken has the habit of ejecting an amber-coloured fluid from its mouth. Some lonely island is usually its breeding-station. One egg only is laid, and this is pure white in colour, and marked with small reddish-brown specks, and rough in texture. A slight nest is made, and this is placed in a hole in a stone wall, among a heap of stones, as well as in old rabbit burrows and holes.

The Fork-tailed or Leach's petrel may be compared in point of size to the Swift. It is somewhat larger than the Stormy petrel, is much rarer, and, except during the breeding-season and in rough, stormy weather, it inhabits the open sea. When the bird is resting, the fork-tail is well displayed.

Wilson's petrel is a still rarer species than the last-

named, but, being a true oceanic bird, deserves inclusion in our story.

I have a very remarkable photograph of a small company of these birds 'walking' upon the water, and it aptly illustrates the curious habit already referred to. Taken by my friend Mr. Herbert K. Job—one of the foremost American ornithologists—this photograph is the most striking Petrel picture I have ever seen. It is reproduced in Mr. Job's excellent book entitled *Wild Wings*.

We now come to the Fulmar. This is our largest petrel, measuring nineteen inches in length. In colour it is grey on the mantle and tail; white on the head, neck, and underneath. The bill is yellow, the legs and feet grey. This species only possesses one breeding-station in our country, and that in the far north, at the lone island of St. Kilda. When not breeding it is rare indeed that the Fulmar comes to the shore, for it is a typical pelagic bird. It is graceful in its movements upon the wing, and reminds one very strikingly of some of the Gulls. It will often follow craft upon the open sea, and dart down upon any offal that may be thrown overboard. When thus following fishing- and whaling-boats, the bird seems at times to float in the air, as it were, without any apparent motion of the wings or body. Only one white egg is laid in the peaty soil at St. Kilda. In some parts of the world this petrel

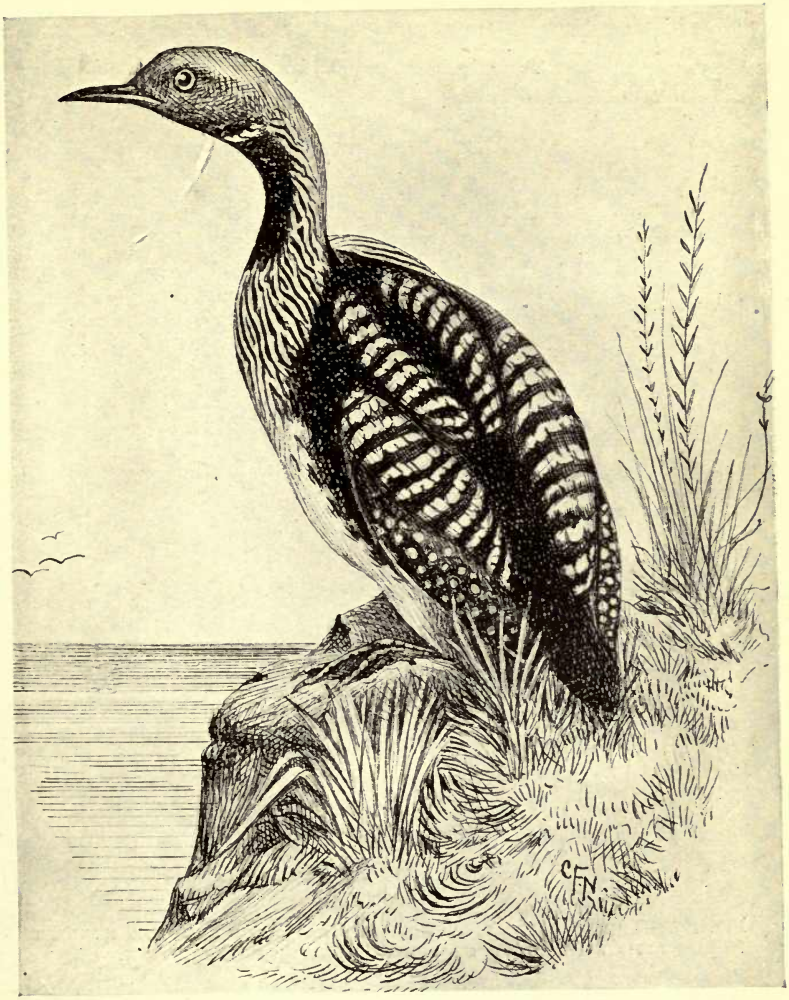


Fig. 28.—Great Northern Diver.

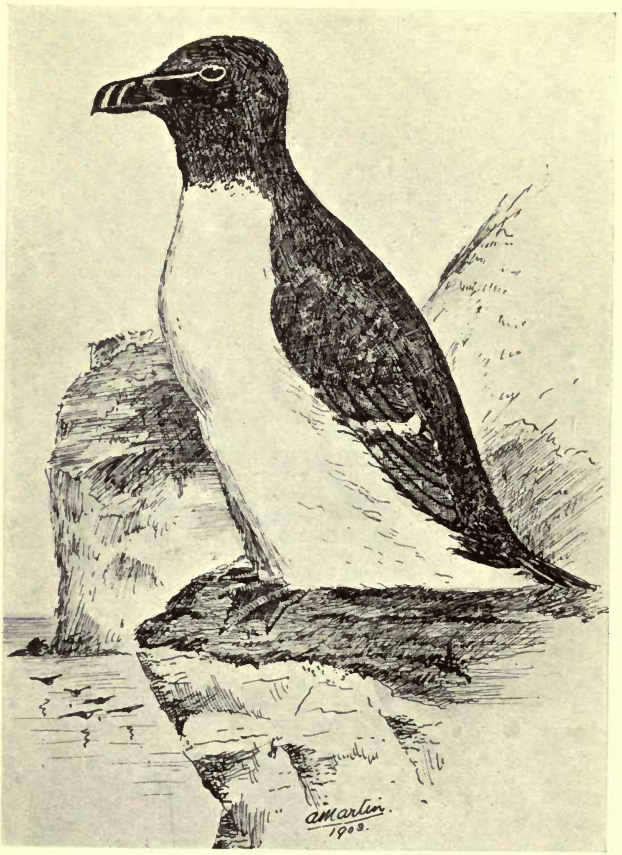



Fig. 29.—The Razorbill, a British Sea Bird, and the nearest living Relative of the now extinct Great Auk.

nests in enormous numbers, vivid descriptions of visits to their breeding-stations having been given by that great observer of bird life, Mr. H. Seebohm, and other well-known naturalists.

The Manx Shearwater claims kinship with the Petrels, and is deserving of notice here, as another typical oceanic bird. Like its relatives already mentioned, *Puffinus anglorum* inhabits the stormy Atlantic and the open sea, excepting at the breeding-season, when it is necessary that it should come to land. Let the storm-fiend be ever so severe in his fury, this bird may be seen bravely battling against the elements, overcoming insuperable obstacles of storm and tempest, and careering gaily over the summits of the waves. The name of Shearwater refers to the bird's habit of gliding along close to the surface of the water. It is remarkable to notice how thoroughly at home this bird is upon the open sea. Its form and habits seem excellently suited to the tempestuous ocean, and the bird appears as happy and contented as the robin of the woodlands in her leafy fastness, or the trim hedge-sparrow in her favourite thorn-bush. This petrel has more breeding-stations than the Fulmar, but, like that species, only lays one egg, which is also white, but much more pure in colour and smooth in texture.

Two more representative pelagic birds that deserve recognition are the very handsome Great Northern and

Black-throated Divers. The Red-throated Diver is an inshore species, and does not claim attention here. The general form and appearance of the Great Northern Diver is well portrayed in Fig. 28, a characteristic sketch by our artist Mr. C. F. Newall. The general colour is black and white, but purple and green reflections are present upon the head, neck, and upper throat, and give the bird a most handsome appearance. This is a large bird, measuring thirty-three inches. The long neck, the straight, sharp, and conical beak, and the manner in which the legs are set far back are well displayed in our picture. Here we have a true bird of the open sea; indeed, it is seldom seen near land excepting when breeding, and beyond this it is rare to catch the bird upon the wing. It is an expert diver, and only those who have seen it at work can form any conception of its remarkable powers. It can either sink its body below the surface of the water, and thus become invisible, or dive with lightning rapidity into the ocean's depths without a second's hesitation. It is fascinating to watch a Diver out at sea, and, when it has disappeared underneath, to scan the ocean around for its reappearance. The general form and structure of this bird is admirably suited for swimming and diving, and when seen upon land it is not always a difficult matter to capture it, the disuse of its wings rendering it on occasions practically incapable of any sustained

flight. The Black-throated Diver only measures about twenty-six inches, and is thus seven inches smaller than its last-mentioned relative. It derives its name from the purplish-black throat. Although an oceanic species, this Diver does not keep so strictly to the open sea as the Great Northern Diver, and also traverses further inland for the purposes of breeding. The plumage may briefly be described as ash-grey on crown and hind head; blackish on upper parts with spots and bars of white; purplish-black throat streaked with white; neck sides striped with black and white; white underneath.

Of birds who resort to the shore at some seasons and are yet found inhabiting the open sea at others, we have only space to mention a few briefly. First come the three Gulls, the Great Black-backed, the Glaucous, and the Kittiwake. The Great Black-backed is a robber. He is a feathered pirate, and largely subsists on the labours of others. This is more particularly noticeable when the bird is observed on land; for, when upon the broad ocean, he mostly feeds upon dead animal matter floating in the water. When not nesting, the Great Black-back wanders far out to sea, yet it is interesting to notice that when it does come ashore at the breeding-season it often travels far inland. I have a photograph in my collection of a nest containing two piebald youngsters, and this was situated two miles from the sea. The yellow bill, flesh-coloured legs and

feet, large size (thirty inches long), are sufficient to identify this very handsome gull.

The Glaucous gull is a typical bird of the open sea, but does not nest with us, being a winter visitor to the northern parts of our country.

One would not perhaps expect to find the Kittiwake far out at sea. It is our smallest gull, and a very delightful sea bird. Its well-known note accounts for its curious name. We shall have something further to say about its habits in our next chapter, but it should be stated here that the bill is greenish-yellow; the legs and feet black; mantle deep grey; head, neck, tail, and under parts, white. Fish is the principal diet, and these it captures with great cleverness, darting down upon them with unerring aim and adroitness.

The Razorbill is an interesting bird to include in our story because, although much smaller, it is the nearest living relative of the now extinct Great Auk. It has acquired its English name from the shape of the bill, and this is well shown in Fig. 29. Greenish-black is the coloration of the bird above; throat deep brown; white underneath; length seventeen inches. The bird is a great lover of the sea. It floats buoyantly, and dives superbly. Fish constitutes its chief food.

This chapter would be far from complete without reference to the Gannet, or Solan Goose. Why it was ever called a goose I fail to understand, for it never

Fig. 30.—Black-headed Gull. (Summer Plumage.)

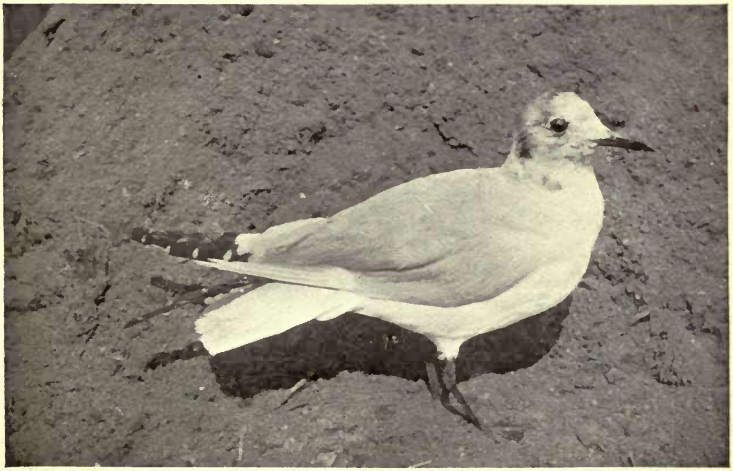


Fig. 31.—Black-headed Gull. (Winter Plumage.)

Fig. 32.—Nest and Eggs of Common Tern.

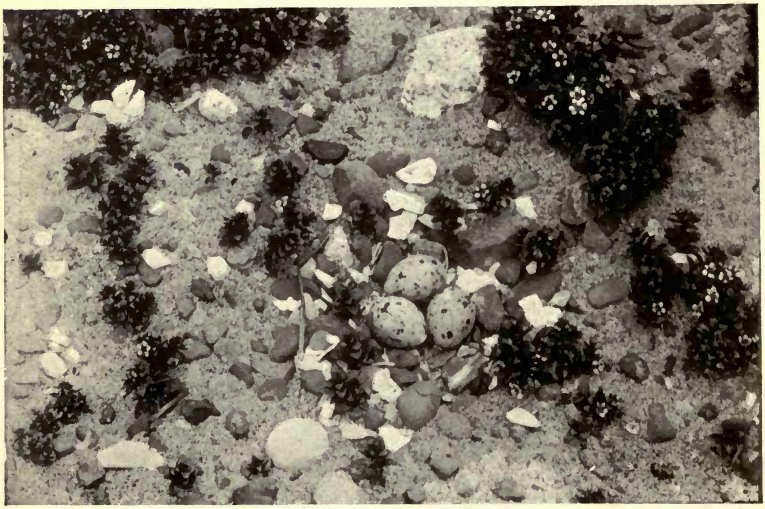


Fig. 33.—Nest and Eggs of Little Tern.

strikes me as at all goose-like, but very much the reverse. This is a wonderful bird upon the wing, and an expert fisher. I have watched it with great interest in the Irish Sea and off other parts of our coast, and often been amazed at its exploits. The bird mounts high in the air, and having reached a certain altitude becomes almost motionless. The reason is that the bold gannet is preparing to dash down upon some fish in the water below. With that marvellous focusing power that belongs to birds who hunt for their food after the manner of this species, the gannet scans the water beneath, and, presto! before one has time to realize what is happening it mounts higher into the air, and then suddenly takes a superb headlong dive, and one next sees it emerging triumphantly from the water with a fish between its mandibles. This is a strictly marine bird, and is found at all seasons in the seas surrounding our coast. One of its chief breeding-stations in our own country is the far-famed Bass Rock, off the North Berwick Coast. I shall not readily forget a visit I paid to the neighbourhood of this remarkable headland a few years ago. The rock, whitened with birds, is wonderful to behold. Only one egg is laid, but over ten thousand pairs of gannets are said to breed on the Bass every season.

The Black-headed gull may sometimes be met with a great distance from land, and deserves notice as a

species to be found on the open sea. Figs. 30 and 31 show this bird in both its summer and winter plumage.

Whilst we shall make closer acquaintance with the common Guillemot in our succeeding pages, this bird may be met with upon the open sea when the breeding-season is at an end, as also may our friend the Puffin, or Sea-Parrot as the fishermen call it. Both kinds of birds are extremely numerous in our country, and very sociable, nesting in dense colonies. Somewhat similar in appearance to the puffin, and very nearly related to it, the Little Auk is sometimes found in considerable numbers in our seas and upon our coasts during severe weather. I have met with it many miles inland, and a few years ago captured one alive in Bedfordshire in a wood on the estate of the Duke of Bedford, a curious place in which to come across such a typical bird of the open sea.

In concluding this brief survey of our own British birds found on the broad expanse of ocean, reference may be made to the remarkable records which have been forthcoming from time to time of small birds such as snow buntings, larks, swallows, warblers, &c., met with far out at sea during their wonderful migration wanderings. Such small birds as these and others are often found upon our big liners, and are observed to be thoroughly exhausted by their perilous journeyings, and pleased to take shelter upon the ocean greyhounds which plough their way through the sea.

PLATE IV.

BIRD LIFE BY THE SEASHORE (CURLEW, HERRING GULLS OYSTER-CATCHER, AND RINGED PLOVER).

p. 127.

## CHAPTER V

### SOME BIRDS OF THE SEASHORE

In this chapter we shall make acquaintance with a number of interesting birds, and our rambles among the sea birds' haunts shall be taken at two entirely different seasons. In the first instance we will make a pilgrimage to the seashore during the nesting-season (April and May); we will pay another visit in late autumn and winter. It will at once be seen how entirely distinct the bird life is at each of the seasons named, for, as has been shown in the last chapter, several birds that come to land to nest take their departure for the open sea when breeding operations are at an end. Then again, when the chill autumn air sets in, and the long nights begin, feathered fowl in great numbers make their appearance from the far North, and work their way along our coasts. At that season many strangers may be noted (and of these we shall have something to say later) as well as a host of wild fowl which do not nest in this country, but seek our more temperate climate during the rigours of a Northern winter.

First let us consider some of the commoner and

more interesting species that nest either on the shore, the rocks or cliffs, or in the vicinity of the sea. The frontispiece to this chapter gives a peep at a scene I have witnessed a number of times when walking by the sea. This is a typical picture of the home life of four kinds of birds who make the seashore, more or less, their habitat. The long-legged and long-beaked bird is a curlew; the gulls shown belong to the Herring species; the black-and-white bird with an orange beak is an oyster-catcher, and the dapper little brown, black, and white bird is a ringed plover. So much in explanation of our coloured plate No. IV.

Pride of place should perhaps be accorded to those beautiful representatives of the Tern family, whose habits are so engaging and whose fairy-like flights strongly remind one of the swift-winged swallow of our English meadows, streams, and lanes. In many respects the Terns cannot fail to strike the observer as giant swallows, their clean-cut wings, long bodies, and general flight resembling the smaller and better-known harbinger of summer in a marked degree.

Several members of the Tern family make their summer home around our shores, such as the beautiful Roseate tern (now very rare), the Sandwich tern, the Arctic tern, the Common tern, and the Little tern. On the present occasion we shall chiefly content ourselves by setting out the salient features of the two last-named

species. All the five species of terns, it should be noted, that nest around our island are migratory birds, coming to us in spring and departing for warmer climes in the autumn. The Little tern is the smallest of the five, being only eight inches in length ; the largest, the Sandwich tern, is sixteen inches in length, exceeding the Common tern by about one and three quarter inches.

The Common species has the bill, legs, and feet orange-red; black head and nape; pearl-grey on mantle ; under parts, rump, and tail, white. It resembles the Arctic tern very closely indeed, and it needs a practised eye to distinguish between the two birds when seen upon the wing. The former is perhaps a trifle longer, and is not so pure white on the under parts, beyond which the Arctic species has blood-red on the tip of its beak instead of the black and coral-red of the Common tern.

Terns are wonderful birds upon the wing, and to watch a company of them wheeling buoyantly over the sea is one of the most fascinating sights in the whole realm of bird life. Indeed, the flight of these sea swallows, as they are so often called, is unique among our British birds. The form of the bird, the plumage, the coquettish flight, the agility and animation, all tend to arrest attention. If the observer possesses the very necessary qualification of patience, he may spend many pleasant hours as the terns pass and repass him. They

are trustful creatures, these, and so intent are they upon their feeding exploits that at times they will fly quite close to the wayfarer if it is seen that he bodes them no harm. The whole time the fairy-like form is pursuing its watchful pilgrimage over the water, its sharp beak is pointed downwards. First in this direction and then that the restless creature pursues the even tenor of its way, and then, suddenly, pulls itself up, as it were, and hovers in the air in a most entertaining manner. Before one has time to realize what is happening, the bird has dashed down into the sea, there is a sudden splash, and the tern emerges from the spray bearing a fish in its bill. If the onlooker has with him a pair of good glasses, let him try to follow the bird in all its remarkable movements, its turnings and twistings, the hovering, the sudden plunge, and the triumphant emergence from the foam. The bright eyes of the tern will be seen to be gleaming with triumph and satisfaction as a moment or two before they seemed to reflect the keen excitement and exhilaration through which the sprightly little creature was passing. The Arctic species is mostly an inhabitant of the northern part of our coastline, nesting in immense colonies—which sometimes number many thousands of birds; but the Common tern is found for the most part south of Lancashire on the West Coast and Northumberland on the East.

None of the five species of terns nesting among us

makes much effort at nest-building, and the nest and eggs of the Common tern shown in Fig. 32 may be taken as a very good example indeed of a tern's homestead. As a matter of fact its nest is usually only a slight depression, but in the nest illustrated a good attempt has been made—as the reader will observe—to build a nest wherein the eggs might be deposited. The nest shown contains the full complement of eggs, three. These are yellowish stone, grey, or olive in colour, blotched and spotted with dark brown or grey. To the left of the nest, it is interesting to point out, are some leaves of the Silver Weed, one of our commonest wayside plants. The Little tern has the bill orange-yellow with a black tip; the legs and feet are orange; the crown and nape black; the forehead and a stripe over the eye are white; pearl-grey mantle; white on tail and underneath.

A good snapshot of the nest and eggs of this delightful bird is shown in our next illustration (Fig. 33). As will be seen, with the exception of a few fragments of shells, stones, &c., very little attempt is made to build a nest. This nest is charmingly situated among some seashore plants. The picture would amply repay examination under a good stereoscopic glass, the eggs standing out boldly and revealing the beautiful markings upon them. These eggs, like those of the Ringed plover, bear a strong resemblance to their

environment, and it is often difficult to locate them. This is a restless little bird, and when one encroaches upon its haunts it utters a scream like its relatives, and sets up such a clamour along the shore that one seems to realize one had no business to intrude! The birds, however, soon become pacified when they see no harm befalls them, and will settle down upon their eggs with commendable courage. This course does not always stand them in good stead when egg robbers, *instead of bird watchers*, are abroad!

Some curious local and old-fashioned names are given to various kinds of terns by fisherfolk and others. Among these may be mentioned Pease Crow, White Daw, Gull Teaser, Picket, Pictarny, Rippock, Tarney, Tarrack, Big Mow, Chit-perl, Rickel Bird, and Surf Tern.

Victor Hugo has stated that 'the beautiful is as useful as the useful'; and if we wish to find beauty in birds—more especially in those of our own country—it would be difficult perhaps to single out any avine family more beautiful than the graceful Gulls, those aerial tenants which so conspicuously ornament our annual sojourns by the silver sea.

Being so spotlessly clean, so exquisitely symmetrical, so chaste and delicate in plumage, so graceful on the wing, it is strange how any one can obtain pleasure in ruthlessly shooting down—often merely allowing

them to lie where they fall, not troubling to gather in the 'spoil'—such pleasing birds.

'My fondest dream,' said John Ruskin, in one of his lectures, 'is that I may make some of you English youths like better to look at a bird than to shoot it, and even try to make wild creatures tame instead of tame creatures wild.'

Slow though the realization may seem, that 'fondest dream' of John Ruskin's appears to be coming true, and the British youths of the present day take a more intelligent interest in birds and other wild creatures than heretofore, and prefer to see them as animate beings rather than as inanimate and oftentimes wretched caricatures of bird life in museums and collections.

The advent of the camera as a means of preserving pictures of real bird life is no doubt largely responsible for this pleasing transformation; and is it too much to say that photographs of some of Nature's wonderful feathered children have as pleasing and educative a value as whole cases of their dead inanimate forms?

Photography not only illustrates but reveals Nature and her countless secrets in many ways. What, for instance, could be more charming than a snapshot of gulls towards the evening hour, the birds, tired of their exhaustive evolutions during the day, having settled down to well-earned rest? Next morning, however, when the first rays of the sun flash across the surface of the

sparkling ocean, the gulls are on the wing—some almost settling on the placid surface of the water, others wheeling round in graceful, curving motions, others swooping along, and all affording an excellent opportunity of securing a lovely picture.

Is there any gain, is there a spark of human kindness, in indiscriminately shooting down these feathered tenants of our coast line and inland waters? *Is* it not more humane to strive after and attain a picture of the living birds?

Londoners are especially to be commended for the manner in which they appreciate and feed even the few wild seagulls who leave their rocky fortresses by the ocean during the winter months and seek the refuge of the Thames, there to please the eye of many a weary toiler, who has little, if any, opportunity of observing them in their native haunts.

It is not the Common gull which visits the Thames during winter, but the Black-headed gull, although the blackish-brown colour is lost after the autumn moult, and is not regained until towards the springtide. Of this bird we shall have something further to say shortly.

Come with me to some rock-girt coast, in all its rugged splendour; bring those indispensable field-glasses into operation, and feast your tired eyes upon the enchanting scene before you.

Does not the sight of those Herring gulls, some

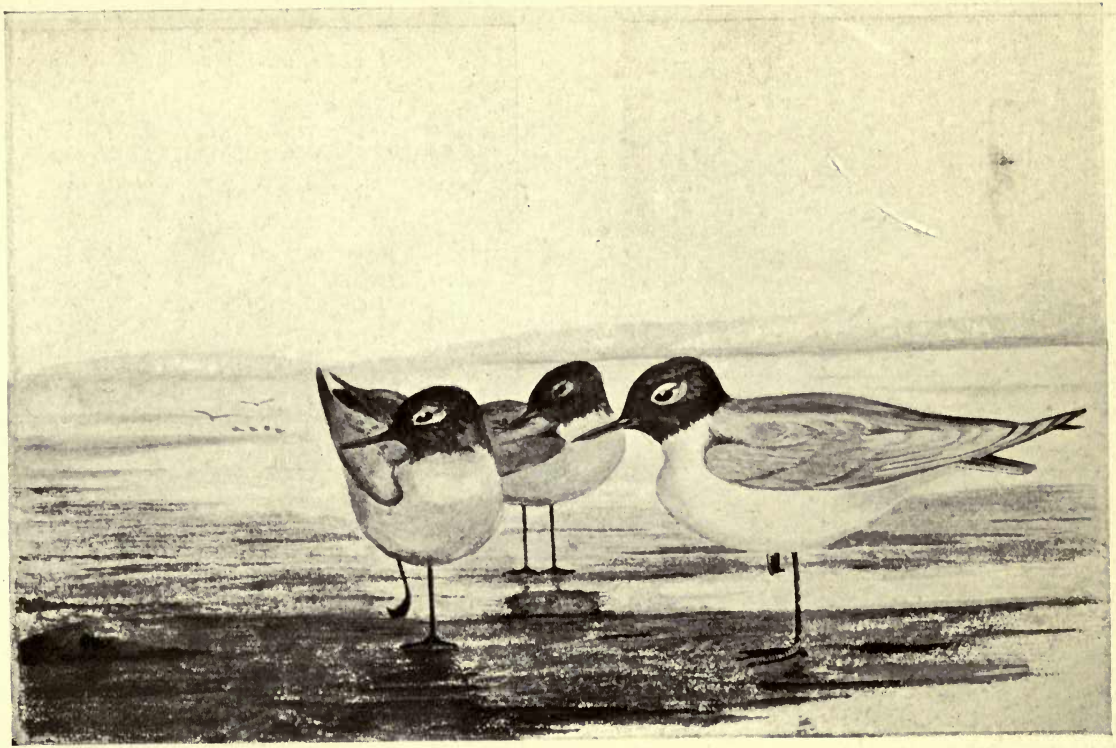


Fig. 34.—Black-headed Gulls in Summer Plumage.

Fig. 35.—Ringed Plover Sitting on Eggs.

Fig. 36.—Eggs of Ringed Plover among Pebbles on Beach.

feeding, some resting, some wheeling round in graceful motions, cause more real satisfaction than shouldering the death-dealing firearm and pulling its wretched trigger?

By the aid of the camera young gulls, captivating and pretty little creatures with which it would be almost sacrilege to tamper, may be added to the Gull-land picture-gallery. How innocent in their babyhood are these piebald fledglings, and how they at once secure a warm place in our affections!

Nature is always waiting to reveal her secrets; 'scenes that are brightest and fair' are invariably to be found to look upon. Nature has no statute of limitations in her membership; her society may be joined by the king on his throne or the peasant in his cottage, the town-bound Londoner or his country cousin; her treasures lie at our very feet. We give the reader a hearty invitation to take his staff and search for fields and pastures new, where he may enjoy the companionship of Nature and learn something of her winning ways.

The young of the Herring gull are known by a variety of curious names, such as Coddy Moddy and Winter Mew. These, when a few days old, are pretty and engaging; but later on, when the downy period is left behind and the nest is vacated, they seem somewhat ungainly with their stumpy feathers and very prominent

beaks. The adult birds are figured in the frontispiece to this chapter.

We recently secured a picture of a couple of young Great Black-backed gulls, which had a twofold interest, for besides being a charming representation of the young birds, towards the left of the picture a skate (the fish illustrated in Fig. 23), which the parent birds must have carried all the way from the sea, no less than two miles distant, is plainly to be seen.

This species of gull, as mentioned in our last chapter, not only captures food for itself, but is a plunderer and robber, its formidable size—it is the largest inhabitant of British Gull-land—rendering the latter doubly easy. Sir Edwardes Moss, in his delightful little volume *A Year in Sutherlandshire*, thus refers to its habits in this respect: 'Great robber that he is—all's fish that comes to his net. . . . Go on the moor in spring, and you may see him and his mate quartering the ground like a brace of pointers, and woe betide the luckless grouse whose nest meets his eye!—eggs and young birds—all will be taken.'

The Black-headed gull does not actually nest on or near the seashore, resorting to inland marshes, waters, and moors for that purpose (mostly, however, not a great distance from the sea). Some of these birds may be observed along our coasts practically all through the year, and no sketch of our British gulls would be in

any way complete without reference to them. This is an abundant species, a vigilant and tireless searcher after food of various kinds, and will even follow the plough in a similar manner to his Sable Majesty the Rook. Fig. 34 portrays an interesting group of three of these gulls in characteristic attitudes resting upon the seashore, and this picture should be compared with Figs. 30 and 31 in our last chapter.

Last, but by no means least interesting among our common gulls, comes the gentle little Kittiwake, one of the most charming, and the smallest, of any of the six species of gulls which we can justly claim as British breeding birds. It has acquired its name by reason of its three notes resembling the words 'Kitty-a-wake,' or 'Ah-get-away, get-away.'

Being a late nester, this delightful gull, which is so graceful on the wing that it strikingly reminds one of the Tern family, is badly served, inasmuch as the young are often only just old enough to leave the family nursery when the close season for sea birds is at an end. The 'scoundrels who practise this form of sport,' as Mr. Hudson so aptly calls them, take advantage of this; and thus the Kittiwake is acting directly against its own interests in putting off until so late in the year its preparations for the nesting-season.

Is it, however, too much to hope that in the immediate future a sound, practical, and workable Bird Protection

Act shall be introduced into our Houses of Parliament, for the preservation of the bird life of our country (which should be regarded as a national asset)? But, better far than all the laws ever made and blue-books compiled, we want to remember the pregnant message of Pestalozzi, which comes to us clearly to-day through the mists of many years: 'Lead your child out into Nature, teach him on the hill-top and in the valleys. There he will listen better, and the sense of freedom will give him more strength to overcome difficulties. But in these hours of freedom let him be taught by Nature rather than by you. Should a bird sing, or an insect hum on a leaf, at once stop your talk; bird and insect are teaching him; you may be silent.'

We now come to that most entertaining little bird of the seashore, the Ringed Plover. It is also called Dull Willy and Wideawake, and I always think the last name is a very appropriate one indeed for this active and engaging bird. I have spent many pleasant hours watching this species on various parts of our coast, and was highly amused last summer at the dapper creatures I saw on the fine, firm sands at Filey Bay, running hither and thither after various tit-bits. My companion on that occasion was none other than the Rev. A. N. Cooper, far better known as 'the Walking Parson.' What with watching the birds and keeping pace with the short but rapid strides of my reverend

companion, I have just cause to remember my visit to that delightful neighbourhood. The only complaint I have to make—if complaint it be—is that my friend the Filey Vicar was entertained to such an extent watching the birds through my strong prismatic glasses that I myself had little opportunity of observing them at close quarters; for, when he had ceased his watching, it was a case of 'quick march' with a vengeance! My wife and little boy set out with us, but before we had traversed very far they were left hopelessly in the rear, watching the pierrots and fisherfolk until we returned!

Fig. 35 will give the reader a good idea of the pretty sight that is presented when the female Ringed plover is sitting upon her treasures, and the next illustration (Fig. 36) shows how difficult a matter it is for her eggs to be detected when laid among pebbles on the beach. It will be observed that these are pear-shaped, and that they are placed with the small ends all pointing towards the centre. Why is this? Because, as very little effort is made (if any) to build a nest, it is necessary that the eggs should be so placed that when the female broods upon them she may cover them all securely and so ensure warmth to them. They are stone-coloured, speckled with black, and some, more than others, appear to taper off at one end almost to a point.

On a sandy or pebbly shore it is quite a difficult matter to locate a company of Ringed plovers, so wonderfully do they harmonize with their surroundings. I have frequently only sighted the birds when I have put them up from almost beneath my feet, or my ear has been attracted by their somewhat monotonous but shrill alarm-note. The bird has a black forehead, lores, and gorget; there is a white band across the former, whilst the eye stripe, collar, and lower parts are the same colour; light brown is present on the nape and upper parts, and the outer tail-feathers are white. The bill, orbits, and feet are orange. The black collar of the female (which is well depicted in Fig. 35) is nevertheless not so prominent as in the male bird.

A bird of the seashore that cannot fail to attract attention is known as the Oyster-catcher, or Sea Magpie. It will thrust itself upon one's notice, as it were. It has intense black and pure white plumage, prominent orange-yellow bill, long purplish-pink legs and feet. Then again it is an active, engaging species, and one of the chief sentinels of the seashore. Like the jay of the woodland, the oyster-catcher gives vent to his feelings in no half-hearted manner, and he warns all feathered fowl within hearing of his clamorous alarm-notes when danger threatens! The young birds are pretty and interesting creatures. Fig. 47 shows one squatting amongst grasses and a little colony of Silver

Weed, a charming picture from life taken by my friend Mr. W. J. Clarke, F.Z.S., the well-known Scarborough naturalist. As the youngster increases in size he becomes more interesting, the dagger-like beak, long stilt-like legs, and high forehead all being prominent characteristics of the oyster-catcher's early days. Although this typical seashore bird feeds upon shell-fish, seaworms, shrimps, and other marine creatures, so far as I am aware he has no particular fancy for oysters, as his name implies!

By means of his strong beak he dislodges and splits asunder limpets from the rocks (and those who have tried to dislodge these shell-fish know how tightly they adhere to their environment), and dexterously opens mussels and scoops out the tasty interiors. The striking rather than handsome appearance of this bird is well shown in the coloured frontispiece to this chapter, and it has an additional charm when seen upon the wing. He is a rapid flier, and as he wheels round, uttering his vehement alarm-notes, cannot fail to arrest, indeed demand, attention.

I have seen the nest and eggs of this bird beautifully situated among the large pink heads of blossom of the thrift, and a very charming picture was presented to the seeing eye. No great effort at nest-building is made, and very often a mere depression serves the purpose. The three eggs are somewhat large, of a

pale stone colour tinged with yellow, and spotted and streaked with black, blackish, or dark brown. The male bird is a model husband, and jealously guards his mate when she is brooding upon her treasures. The young are soon able to run about and take care of themselves, and often exhibit the wariness of the parent birds.

We may now give a short account of the work of some of our Yorkshire cliff-climbers. The next half-dozen photographs (Figs. 37 to 42 inclusive) admirably illustrate this portion of our story. Last summer I spent a delightful holiday in the neighbourhood of these wonderful chalk cliffs of Yorkshire, so that the photographs, taken by Mr. Sydney H. Smith, and the subject treated of, have for me a twofold interest. The feathered tenants of Bempton Cliffs (not far from the well-known Flamborough Head) have attracted many naturalists, especially when the cliff-climbers of the district are busily engaged collecting eggs. I am mainly indebted for the information which follows to a most authentic and excellent little brochure written by Mr. E. W. Wade, M.B.O.U. Four gangs of four men each are now regularly employed during the season at the Speeton and Bempton Cliffs. Occasional raids are also made near Flamborough Head by fishermen, and various collectors visit the breeding-stations during the season. The right to gather eggs belongs to the farmer whose land abuts upon the cliff-top, and this right he grants

Fig. 37.—Cliff Climbing on the Yorkshire Coast. No. 1.

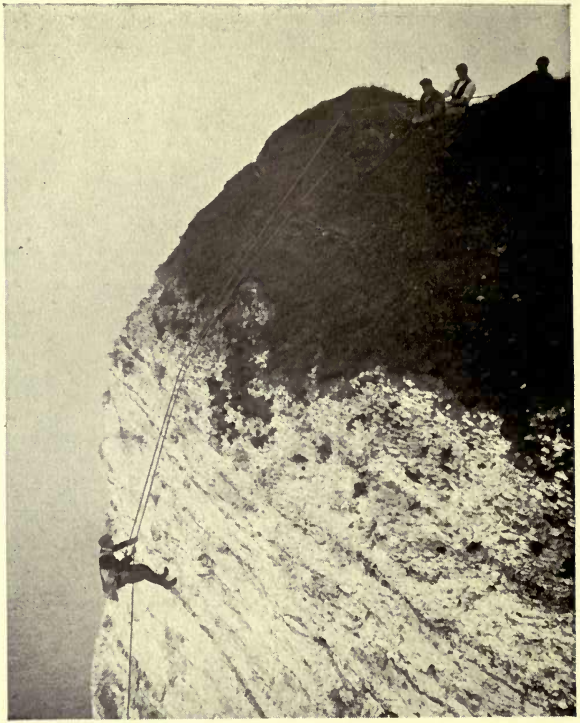


Fig. 38.—Cliff Climbing on the Yorkshire Coast. No. 2.

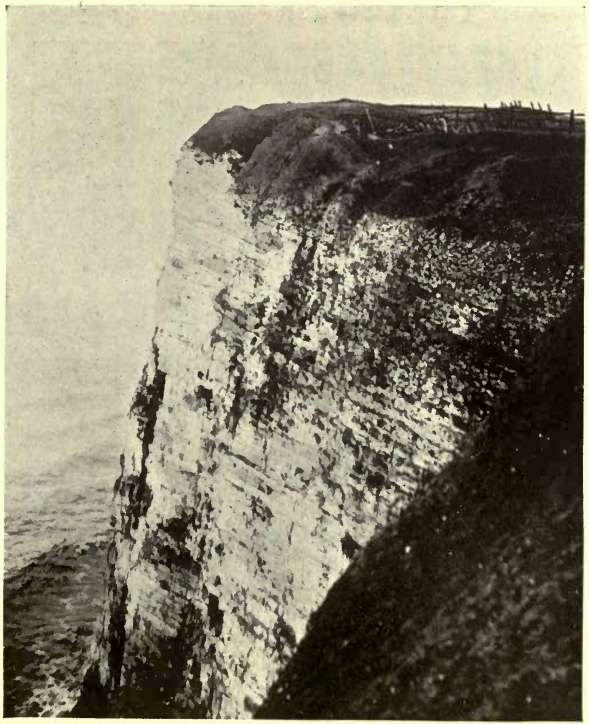


Fig. 39.—Cliff Climbing on the Yorkshire Coast. No. 3.

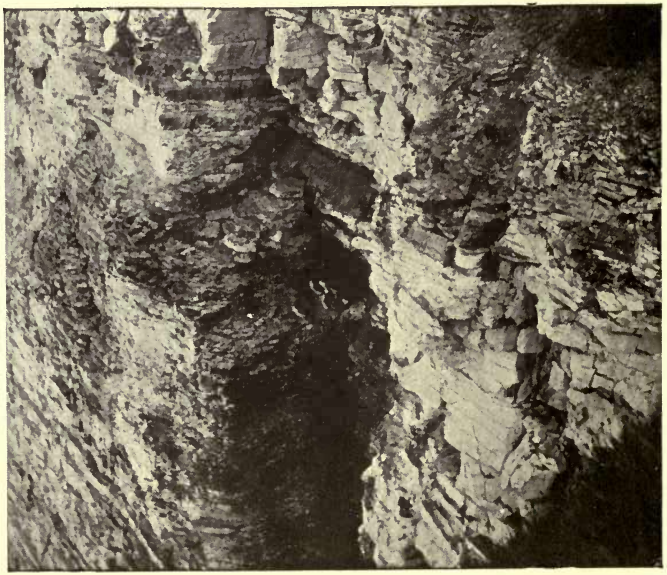


Fig. 40.—A Little Group of Razorbills in a Cave on the Cliff Face.

to the men who work for him when egg collecting is out of season. The season begins about the third week in May, and ceases towards the end of June or early in July. The average daily collection of eggs is given by Mr. Wade as from 300 to 400, or about 130,000 eggs in all per season, after making allowance for those days when the inclemency of the weather does not permit of safe cliff-climbing. It is remarkable to note that in spite of this collecting most of the birds—and the eggs collected are those of the guillemot, puffin, razorbill, jackdaw, carrion-crow, kittiwake gull, &c.—are yearly increasing! The prices realized vary. Sometimes twelve or sixteen are sold for a shilling. Those specimens that are better marked, however, make higher prices, ranging from twopence to as much as £1 each. These latter are good red specimens of the egg of the guillemot. Many of the eggs collected are eaten, others are used to clarify wine and dress leather. Each part of the cliff allotted to a certain gang is systematically worked daily during the short nesting period, but a ledge cleared of its eggs to-day will be left for three days to allow others to accumulate. Eggs brought to the cliff-top and found to be partly incubated and unfit for human consumption are given to pigs.

The exact methods employed in what may at first sight appear a hazardous occupation are admirably

portrayed in Figs. 37, 38, and 39, showing the cliff-climber at work. It will be observed that a strong iron stake is driven into the cliff-top. To this a rope is attached, the loose end of which is thrown over the cliff. This latter is called the hand-rope, as it is held by the climber (as well shown in Fig. 38), and by means of it he swings to and fro and regulates the amount of weight borne by his comrade at the top. I cannot do better than quote Mr. Wade's own interesting story as told in *The Birds of Bempton Cliffs*, published by Messrs. A. Brown & Sons, Ld., London, Hull, York.

Mr. Wade writes: 'A hemp sling, made in the form of two loops, through which the legs are thrust, is fastened firmly to a belt round the climber's waist, and attached by two hemp eyelets in front to a second rope. It is then passed round the body of the man who does the lowering, being prevented from cutting through his clothes by a strong leather apron worn round his waist. He sits on the ground and holds the rope with a hand on each thigh, letting it run through his fingers. The climber retreats backwards towards the edge of the cliff, holding the fixed hand-rope in one hand, and in the other a revolving wheel mounted on the end of an iron stake. This he sticks into the edge of the cliff, passes his body-rope over it, and after carefully clearing away all loose stones from the vicinity of the ropes, goes merrily down the cliff, kicking off from the rock and

keeping himself perpetually swinging to and fro to prevent his commencing to spin round where the rock is overhanging. Whenever he reaches a ledge with eggs he stops, letting his mate above know that he is getting them by taking part of the weight off the body-rope. The man at the top then holds the rope in both hands, pressing them against one of his thighs.

'When the climber has cleared the ledge, he kicks himself away from the cliffs, puts his full weight on the rope, and is lowered again. Both the man at the top and the climber carry handfuls of grass, without which their hands must blister at the first descent, for these practised hands waste no time over the work, and, if necessary, a man will drop down a hundred feet in two or three minutes to get to the ledge where the eggs are. When descending, therefore, the hand-rope is held very loosely as a rule. The extra two hands at the top meanwhile are occupied in uncoiling ropes, seeing that they run straight, &c. A regular code of signals is employed through the agency of the rope passed round the waist of the man above, which, when jerked by the climber, tells his mate what he requires. A single jerk means he wishes to come up. The laconic command "up" is then given, and all three men commence a "tug of war," by which the climber is raised to the top. Two jerks mean more hand-rope, and the command "more band" is given and executed. Three

jerks mean "less hand-rope." The rope, when hanging down too far below the climber, by its weight prevents his free swing to and fro, and consequently he must not have more out than is necessary. Of implements the climber has none, save two linen bags, one slung across each shoulder transversely to the opposite side of the body, and a stick, with an iron hook at the end. An old "billycock" hat padded with cotton-wool, or, better still, a tall hat, protects his head from falling stones—the only danger he dreads. Fear of anything else is unknown to him. The qualms which a beginner feels, when, for the first time, he has to launch himself backwards off an overhanging cliff (comparable, I should say, to those of a gymnast doing his first 80 ft. fly), become, to the practised hand, a delightfully exhilarating sensation. Sometimes he can only succeed in reaching an egg by swinging in, catching at it with one hand, and swinging back without resting on the ledge with his feet at all. Sometimes he walks sideways along a ledge collecting eggs until he is some twenty or thirty feet out of the perpendicular. To save the trouble of walking back he kicks off from the ledge, when all the eggs are gathered, and swings back to the perpendicular. This is the hardest sensation of all for the beginner to master. Where the cliff is undercut so much as to make the eggs unattainable, iron pegs are driven in at intervals by the climber. Round each of

these he winds his hand-rope in turn as he comes to them, and so draws himself under to the desired ledge. He peers into each cranny as he goes down, and if he sees a puffin glowering at the end of her burrow, or, mayhap, a pair of rock-dove's eggs out of his reach, the stick and hook are brought into requisition to draw the eggs to him. At Jubilee Corner, where the rock is unusually overhung, a permanent wire rope is fixed in the rock. This was first placed there by attaching it to the middle of a rope, the ends of which were held on each side of the projection, thus forming a loop, which may be described as similar to a skipping-rope. The loop was then thrown over, the ends pulled tight and secured, and the wire rope was ready for descent, being afterwards permanently fixed by iron pegs. Considerable ingenuity has been brought into the science of climbing, and save where the rock is loose and rotten, a way to any ledge can be found, however difficult of access. So often have the ledges been climbed that the man at the top knows almost as well as the man below what is going on, and mechanically holds or lowers as required. When the work is exceptionally severe the climber sometimes rests on a ledge for a few minutes, but, as a rule, goes straight through with his work till all the ledges within reach are cleared, when the signal is given and he is hauled up, stopping sometimes on the way up to gather an egg which had been overlooked

on the way down. When he reaches the top the bags are emptied into a huge market basket. Should one of the eggs be broken, old Ed. Hodgson turns to the crowd of boys who are generally present, and, with the ghost of a smile wrinkling the corners of his mouth, says, "Can any of you yoong gentlemen sook a hegg?" Some boy more bold than the rest tries, but the contents of the guillemot's egg are generally too stiff for him, and he spits it out amidst the laughter of his companions.

'Very few accidents happen to the climbers. Edward Hodgson ceased climbing at fifty-two, being then, as his son said, "ower numb" to negotiate the ledges. Sometimes ladies have been known to go down the cliff, and a beginner who "frames well" is said to be "middling fierce at job." I can only recommend any one in search of a new pleasurable sensation to try climbing. The men will look after you and see that you run into no danger, and the excitement is, perhaps, greater than that gained in any other form of athletics.

'At the close of the day the eggs are pooled in one large heap and shared out, each man taking three eggs in turn till all are appropriated. The eggs are then carried home in market baskets.

'There are some interesting problems to study in connexion with the guillemots and their eggs. The persistence of the birds in sticking to and coming back to the same ledges, however much persecuted, is one

of those characteristic traits which have given rise to the epithet "stupid," as applied to this species, as is also its refusal to leave the egg sometimes until captured by hand. Of the former we can say that a closer study of nature shows the same persistence more or less evident in all birds, who prefer coming back to the same ground year after year, unless driven away; of the latter, that the bird must be aware that leaving the egg generally involves the destruction of the egg. The colouring of these birds' eggs also opens up many interesting problems.

'The numberless varieties in colour shown can hardly be due to the attempted predominance of one colour which is more protective than another, because the predominant colour, green and black, makes the eggs most conspicuous. Is it, as Dixon in the introduction to the second volume of Seebohm's *British Birds* suggests, that the absence of foes gives the guillemot's egg a freer hand to branch out into varieties than those of other birds? The foes present—viz. jackdaw, gull, and man—are very deadly in their way, but in spite of them the birds and eggs increase. Of the jackdaw and gull, it is impossible to say whether they prefer any special type of egg. As far as observation goes they do not. Of man it is asserted that by taking all the rarely marked eggs he can get, he has diminished the numbers of such eggs gathered each year. This state-

ment, however, as it cannot be accurately measured (most of the climbers being unscientific observers, and most of them getting more and more by the sale of rare eggs each year), is also open to doubt. These varieties occur only very rarely, one abnormal egg in a thousand being about the average per season, and if they indicate a permanent departure from the normal type, the movement can only be in its inception. Given a sufficient number of eggs to select from, any species of bird will be found to produce many abnormal eggs, but none so far removed from the common type as those of the guillemot. The cause, however, to which this abnormal variation can be assigned appears to be shrouded in mystery.'

The precipitous character of these rugged chalk-cliffs of the 'County of Broadacres' is well shown in the photographs that illustrate this portion of our story, and in Fig. 40 will be seen one of the caves in the face of the cliff containing a little company of razorbills. This bird was mentioned in our last chapter, and illustrated in Fig. 29; and whilst its plumage has already been described, a few further particulars may be given. Although not nearly so common as the guillemot—next to be described—there are many parts of our coast where this interesting bird may be found. It appears, however, that it is decreasing, and seems to be subject to some kind of mortality as yet unexplained. Mr.

Fig. 41.—Emptying the Egg Pouches after a successful Climb.

Fig. 42.—A Morning's Haul of 500 Eggs.

Fig. 43.—Curlew.

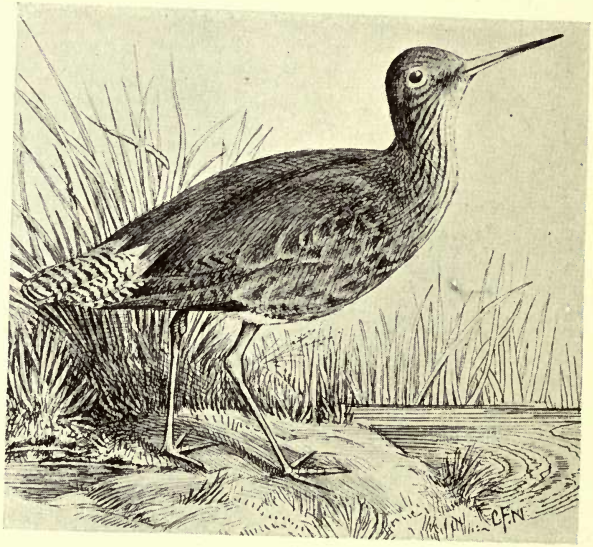


Fig. 44.—Redshank.

Hudson states that he has seen their dead bodies lying in hundreds on the beach on the south coast, washed up by the waves after a severe gale. It seems extraordinary that no definite reason can yet be assigned for this mortality. Some naturalists assert that the birds are starved to death, others suggest that an epidemic may set in among them; but for some unaccountable reason a large number are yearly found around our coast-line, and their ranks are, as a consequence, becoming thinned out to an alarming extent. This is a handsome and interesting bird, and when not breeding may be observed floating buoyantly upon the water, or busily engaged diving after fish.

Only one egg is laid. The razorbill, guillemot, and puffin are frequently found nesting quite close together. I have seen many beautiful specimens of the egg of this bird. Generally, the ground colour is whitish, spotted, and blotched with various shades of blackish and deep reddish-brown. Some specimens I have in my collection are also strongly marked with a rich chocolate colour, giving the egg a very handsome appearance. Usually a somewhat silent bird, the alarm-note is like a curious and distressing moan. The male and female both help to incubate their solitary treasure.

Of the Guillemot much might be written, but a brief biography must suffice. The cliffs of Yorkshire illustrated

in our photographs are famous as one of their homes, but on several other parts of our rocky coast they breed in immense numbers. For some time it was argued that there were two distinct species of guillemots, but it is now agreed that one is merely a variety of the Common species. This variety is known as the Ringed or Bridled guillemot, and is to be distinguished from the typical species by possessing a white rim round the eye and a white line that extends from the outer corner of the eye down the neck. The typical species does not possess these features.

It has often been stated that the egg of this bird, being pear-shaped and very weighty, is so fashioned that, let the wind blow even a hurricane, it will revolve on its own axis, as it were, and be secure against the ravages of the wind-fiend. Mr. Wade, among others, holds that this observation is incorrect, and the arguments he advances in support of his opinion are striking. He says, speaking as a practical and experienced climber extending over a number of years, that the breeding-haunts of the guillemot are mostly sheltered from the wind, and that although eggs do undoubtedly get dislodged from their resting-place, he has himself seen the parent bird actually kick her own eggs off the ledges. The birds are also said to be very careless, and the act of leaving the egg often causes it to roll off the ledge into the sea below. When the bird is sitting the egg is snugly

stowed between the feet by means of the bill, and is covered over by the feathers of the thigh; then the bird sits upon it either in an upright position, or in the more orthodox manner adopted by sitting birds. The position taken up, however, is lengthways along the egg.

Whilst it has been stated with some amount of truth that no two guillemots' eggs have ever been found exactly alike, it is a fact that where hundreds and thousands are laid close together a great similarity may be seen. So much so indeed that it is a birdland mystery how each bird knows its own particular egg. Here again we may have credited this bird with keener intelligence than it really possesses, for the observer already quoted in this chapter states that he has found a number of eggs unattended, and it may be that the owners had failed to recognize their own production again.

When seen from the sea as they are sitting upon the face of the cliff, guillemots present a curious appearance, the white breast and black throat and head reminding one of so many feathered and miniature choir-boys robed in white surplices with black hoods!

When I visited these far-famed Yorkshire cliffs in 1907 I spent many pleasant and profitable hours watching the gulls, whimbrels, Ringed plovers, kestrels, jackdaws, rock pipits, and other birds, making quite a lengthy sojourn on the summit of Gristhorpe Cliffs when

walking along the coast to Filey Brig. Mr. Wade states that the cormorant 'has no breeding-place nearer than the Whitby district and the wreck of the *Beaconsfield* at Aldborough,' but I know that this bird breeds in the Gristhorpe Cliffs, for I have myself observed it there. Last spring there were about ten nests there, and an odd pair also nest annually in the cliff at Filey Brig. The cormorant is a most interesting bird, even if it is not imbued with particularly cleanly habits when nesting. I admire its patience as much as any other trait in its character, for I have watched the bird from the cliff-top, and on a little island left by the tide I have seen it sit for hours at a stretch with scarcely a movement. I saw also many gulls (in such various stages of immature plumage that the greatest expert would be baffled almost), a whimbrel or two, an oyster-catcher, and some Ringed plovers. They all kept a respectful distance from the cormorant, and he had a little corner all to himself! In colour this bird is mostly black, but the throat is white and the gular pouch yellow. In the spring there is also a patch of white on the thigh. It is a big bird, measuring three feet in length, and the elongated feathers on the occiput form a crest in spring, and give it a more imposing appearance. This sea bird possesses a voracious appetite, and although ungainly on land, is an expert swimmer and diver. It feeds exclusively upon fishes, and one

fourteen inches long has been extracted from its gullet. The beak is hooked at the tip. Sometimes as one watches this bird it will be seen to open its wings for a little time in order to dry them. When it rises, the movements are the reverse of elegant, but when fairly on the wing the flight is powerful. These are sociable birds, and nest in large numbers in many favourite spots around our island. The nest is composed of sticks, coarse grass, and seaweed, and is a large structure. The three to five eggs are narrow and long. They are pale greenish-blue in colour encrusted with a thick chalky substance. Young cormorants are born blind and naked, but in a short time a black down is grown which thickly covers the body. These are somewhat ungainly-looking fledglings, and have mortal dislike for mankind. They assume all kinds of positions when approached, exhibit anger of a vehement kind, scream loudly, and bring up half-digested food! When feeding, the young bird thrusts its head into the parent's gullet and secures food that has been partially digested. Mr. Hudson aptly compares this procedure to a horse feeding from his nose-bag.

The Shag or Green cormorant is not such a large bird as its last-named relative, being about twenty-seven inches in length. The black plumage is replaced by dark green with purple and bronze reflections, but the former colour is present on the wings, tail-feathers, legs,

and feet. In the breeding-season the birds may be further distinguished by the absence of the white patch on the flank in the present species.

Whilst the cormorant will leave the neighbourhood of the sea and take up a position on some inland water and breed there, the Shag is more strictly a marine species. It is a wonderful diver, and when about to plunge springs right out of the water and takes a superb headlong dive. When under the water it swims rapidly with its feet, and does not use its wings in the manner carried out by some other kinds of sea birds. It nests in colonies, and is as disgusting in its breeding-habits as the cormorant, if not more so. The clutch consists of three eggs. These and the nest both resemble those of the last-mentioned species.

This brings us to the last British breeding sea bird with which we need at present concern ourselves, the Puffin, or Sea Parrot. At all times an interesting if somewhat stupid bird, one of the most curious points in connexion with its life-history is the enormous sheath which envelops its beak during the nesting-season. When that all-important time is at an end the sheath drops off. In colour this sheath is red, with orange bars, and seems to serve the purpose of a nuptial adornment, which apparently adds to the bird's attractiveness, and helps him to woo and win the heart of a female bird. Of these interesting courtship ways in birdland

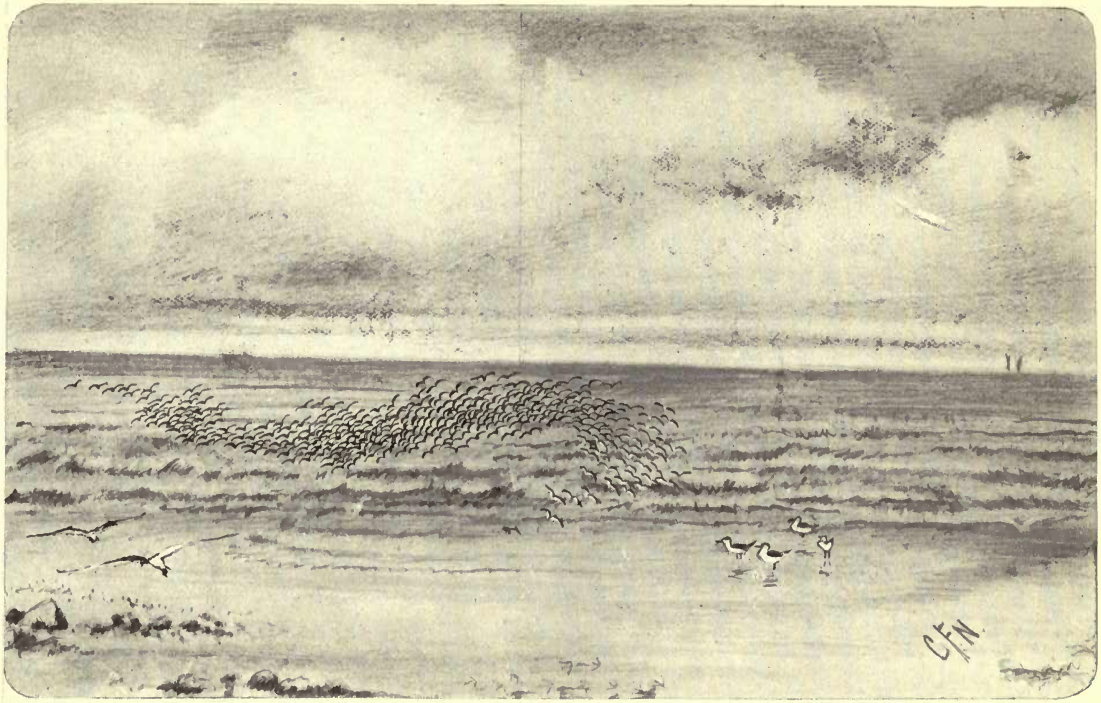



Fig. 45.—Knots in Flock on Seashore.

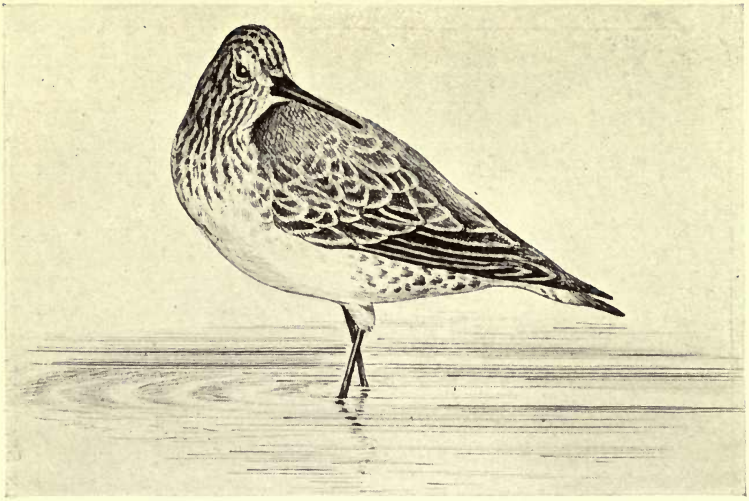


Fig. 46.—KNOT.

Fig. 47.—YOUNG OYSTER-CATCHER.

I have written at some length elsewhere, but it is well to notice here that where birds do not possess fine feathers they are often found to have good voices, and where they possess fine plumage (the kingfisher as an example) they are the reverse of musical. It is really wonderful to observe how Dame Nature looks after the interests of her feathered children, for it has been noticed that birds possessing good singing powers, or birds possessing brilliant plumage or other notable characteristics, are the ones who emerge most triumphantly from courtship rivalry. There are, of course, other notable devices for securing a female partner, and in some instances battles are fought for possession of the female. I have myself seen both small and large male birds locked firmly together, so desperate was the love-encounter between them.

To return to the subject of our sketch, when the breeding-sheath falls off, the beak is found to be smaller in size and dull in colour. Nevertheless, the puffin even then exhibits quite a foreign appearance, and although such a common bird (notably in St. Kilda and elsewhere), many people on seeing it for the first time express surprise when told it is one of our commonest sea birds. It is closely related to the Little Auk referred to in our last chapter, and distinctly auk-like in general appearance. The plumage on the crown, collar, and upper parts is black; all the remainder is white. The legs

and feet are orange-red, and the length of the bird is twelve inches.

When nesting on the cliffs the puffin lays its one white egg in a hole or cranny, in a similar way to the razorbill. It is quite unlike the guillemot in this respect, as this last-named bird places its egg on ledges in most exposed situations. When nesting among peat and other soft soils, however, the puffin constructs a burrow and lays its one egg at the end of it. Sometimes the burrow of a rabbit is taken possession of by force, but for the most part the bird burrows on its own account. The young are covered with black down, and during their babyhood the beak is small and dark in colour.

As a fisherman the puffin is an adept, and has the wonderful habit of holding securely a number of fishes in its beak until it has obtained a sufficient supply. The little fisherman goes on diving and fishing unhampered by the prey already secured, and when the parent eventually reaches its burrow the hungry fledgling sits waiting at the entrance ready to be fed.

Other birds regularly nest near the seashore, such as the kestrel, the jackdaw, the meadow pipit, the rock pipit, the rock and stock doves, and the handsome sheldrake; but it is not necessary to deal with them here. We shall devote our remaining pages to those representatives among our feathered friends who are

found around our coasts chiefly during autumn and winter.

At the beginning of September, and in some cases earlier, a tremendous migration sets in among the birds of Northern climes, who gradually work their way along the coast, halting at various feeding-stations. These birds either sojourn among us until the winter is about to leave us—when they also depart for their breeding-stations in the north—or they pass along our coast-line, or over our land, on their way to winter quarters further south. Other feathered folk who have bred on the moors and inland places congregate in flocks on the mud-flats and the salt-marshes during autumn and winter, and there remain until the following spring.

When the autumn migration begins in real earnest the careful observer of the bird life of the seashore has to have all his wits about him, for not only is the variety of birds to be met with very remarkable, but many rare species put in an appearance, and the changes of plumage in some birds make identification difficult. As showing what rare birds may be seen during the autumn on the Yorkshire coast, for example, some notes sent to me on October 11, 1907, by Mr. W. J. Clarke of Scarborough, may here be given. He writes:

'I have had a very interesting season so far. September is always the busiest month of the year for

me, the opening of the wild fowling season providing me with a rush of work while the migration season is on. There has been a big migration of Richardson's skuas, but that species only—no Pomatorhine's, or Buffon's, or Great skuas. Both the light and dark type are present, and all intermediate shades between. It is astonishing how this species varies literally from black to white. Other birds which I have had, or seen, this season (i.e. since September 1) are: 1 Golden eagle, 4 Levantine shearwaters, 1 Sooty shearwater, 1 Manx shearwater (picked up alive running on the roadway in the principal street of Scarborough), 2 Sabine's gulls, 2 Little gulls, 1 Hen harrier, 1 Common buzzard, 2 Black terns, 4 Sandwich terns, &c.'

The indiscriminate slaughter of interesting and rare bird visitors to our shores is a painful subject. A large number of sea birds are left where they fall, some killed outright, others wounded. We distinguish of course between these slayers of life and the legitimate and discriminate sportsman and collector, who does not kill for killing's sake, but who preserves his trophies and does not bang away at every feathered fowl that comes within gunshot. For our own part, however, we find still greater pleasure in visiting the mud-flats, the salt-marshes, and the seashore, during autumn and winter with a harmless field-glass and camera, and it is to this branch of bloodless sport that the reader's

attention is directed. Let us then wander in these situations and take a peep at the bird life astir.

During the summer the mud-flats and the salt-marshes are almost denuded of birds, but a great change may be observed before August has long come in. At the latter season the flats and marshes are peopled with an animated feathered population, made up of curlews, Ringed plovers, knots, redshanks, whimbrels, various gulls, geese, ducks, skuas, sanderlings, stints, Hooded crows, swans, turnstones, &c. These are busy folk, and may be seen assiduously searching for food, probing their beaks into the soft ooze, preening their feathers, resting, quarrelling over some delicate morsel that a more fortunate fellow has discovered, now taking to flight and wheeling round, now screaming. It is a delightful scene in wild life, and with the exception of the nesting-season I know of no other time in the course of Nature's year when bird life may be observed under such favourable and engaging conditions.

Let us consider, then, the biographies of a few of these birds, choosing as our representatives for the most part those species of which our artist has supplied characteristic studies. First comes the Curlew, a near relative of the whimbrel shown in the frontispiece to this chapter. From Fig. 43 a good general idea may be gained of the appearance of this interesting bird. The long, slender, and arched bill; the long and pointed

wings, small head, long neck, and square-like tail are features that will at once attract the attention of the observer. The plumage above is mottled brown in colour; rump white; under parts the same colour as last named, but streaked and barred with dark brown. When the bird is seen upon the wing the barred and mottled brown and white wings and tail are very prominent. This typical winter seashore bird breeds on the moors and higher districts during the spring. It prefers a swampy locality, but I have seen the bird in its summer home across the Scottish moorlands high up the hillside far removed from marshy ground of any description. The form of this bird and his weird cry are both in keeping with the lonely solitudes. Its call, '*curl-ee, curl-ee,*' is loud and far-reaching. This is a wary bird, and it is with difficulty that one can approach it at close quarters. A description of its nesting-habits does not now call for attention, but its handsome green-and-brown eggs are pear-shaped, tapering off almost to a point, and are strongly marked.

In winter, when the curlews have left the higher latitude and come down to the seashore until the following springtime, we may watch them carefully through our binoculars busily engaged feeding with other feathered folk. It is a mud-flat we are wandering over. Some distance in front of us is a company of birds. We find after close inspection there are a number of curlews

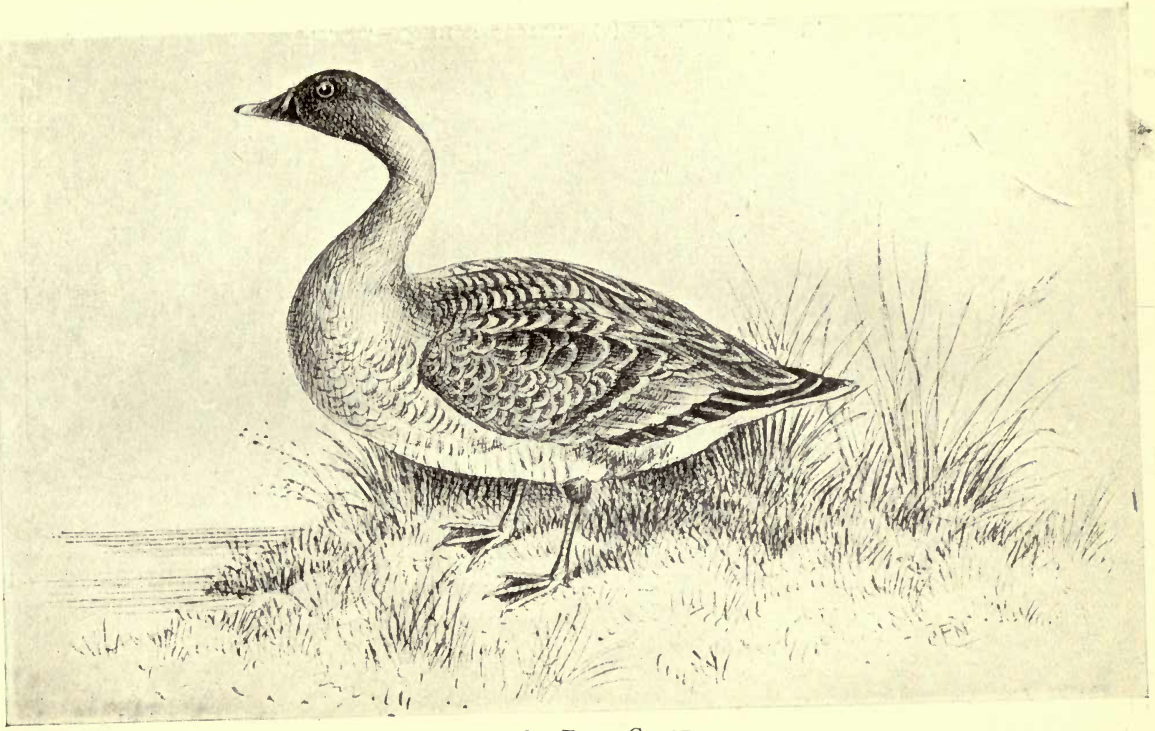


Fig. 48.—Bean Goose.

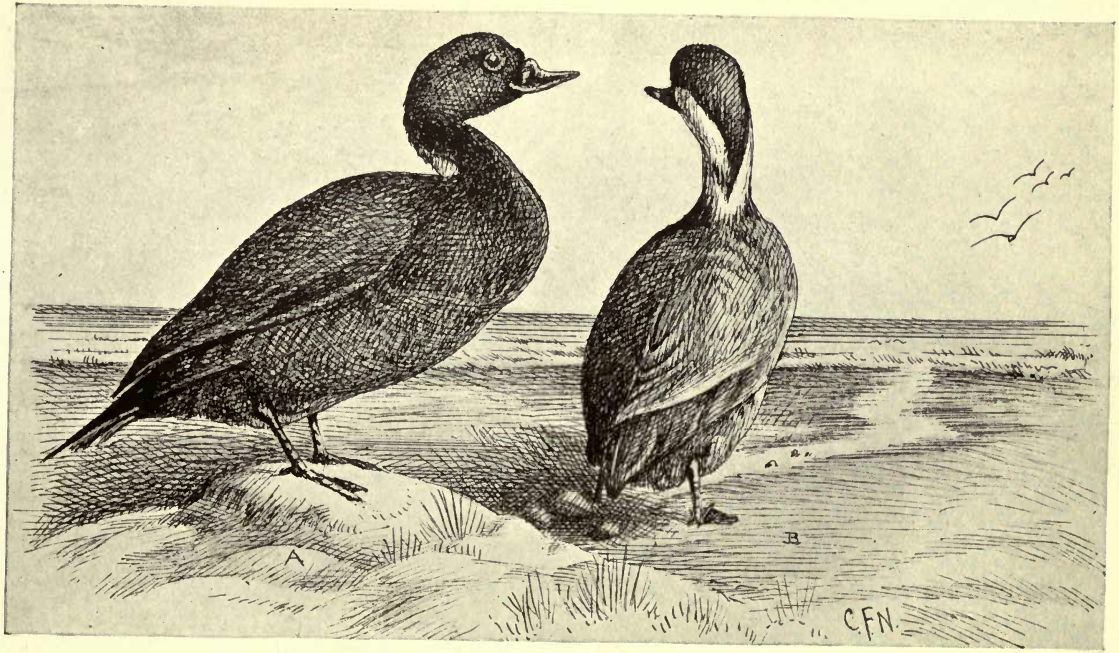



Fig. 49.—Common Scoter. (A) Male. (B) Female.

(gregarious in winter), several noisy oyster-catchers, some plovers, a whimbrel or two, and some little birds with long legs impossible to identify accurately so far away. The curlew especially attracts us as he stands in the little pool of water as shown in our illustration, his long legs being of great assistance to him in this respect. Down goes the bird and up again like a feathered jack-in-the-box as he is busily feeding, such marine life as sandworms, crustaceans, and others forming his dietary.

The Whimbrel, it should be noted, is very like the curlew, but may be identified by a prominent pale line along the middle of the dark brown crown, and the possession of two lateral bands of the same round the latter. The whimbrel, moreover, is greyer above, and has other distinguishing features of plumage. It is also a smaller bird, the female measuring about eighteen inches, whilst the female curlew measures from twenty-one to twenty-six inches. Of the large number of these birds which pass along our coasts during the autumn only a small percentage winter with us, the majority move on to more southern quarters. Their migration from the north commences as early as the end of July, and early in August 1907 I observed with considerable interest some of these birds off the Yorkshire coast. This bird does not breed in England, indeed not on the mainland at all, nesting only in the Hebrides and the Orkney

Islands. That most accurate recorder of bird life, Mr. Charles Dixon, remarks upon the astonishing regular migration of some kinds of birds, such as the whimbrel. He writes of the birds passing regularly over England during May on the return journey to their breeding-quarters, almost to the night, and says that they may be 'easily identified from the earth below by their expressive cries, resembling the syllables "*tet-ty, tet-ty, tet-ty,*" quickly repeated in a musical bubbling tone. Thus in many places the bird is commonly called the "Titteral."'

I remember with what pleasure I looked upon my first Redshanks. It was off the Scottish coast, and in company with them were some dunlins and Ringed plovers. Of the former we have a remarkably fine and characteristic portrait in Fig. 44. What first attracted my notice was its active movements, its somewhat unsteady flight, its piercing, clamorous cry, and its orange-red legs and feet. This is a resident bird among us, and breeds in many parts of our country where marshy surroundings are found. It will perhaps surprise the reader to know that during the nesting-season the male redshank not only perches in trees, but also utters a trilling note as he takes flight and hovers in the air. The bird is about eleven inches in length; its winter plumage is ashy-brown above, with some darker markings; white underneath, sparingly marked with brown on the breast

and flanks. At the approach of autumn the bird forsakes its inland fastnesses, and resorts to the tidal flats and saltings and the seashore. At this latter season, too, an inrush of visitors takes place from northern Europe. The birds feed as the tide goes out, and that is a fine time for the observer to be on the alert. Little companies of them wait for the uncovering of their feeding-grounds, and keep up a continual chattering. When the tide has sufficiently receded for their purpose the flock disbands, and the members scatter in all directions and pursue their feeding-movements. The food is made up of marine creatures of various kinds, such as worms, small crustaceans, insects, &c.

This bird, like others of the same order, often feigns to be wounded, and flutters along in front of the observer so as to draw him from the neighbourhood of the nest or young. Indeed, during the breeding-season the redshank shows his distaste at being disturbed by dashing at the intruder, clamouring loudly, and thus proclaiming to all feathered folk that danger threatens.

As giving some idea of the large flocks of birds that may be observed during the winter along the shore, attention may be directed to Fig 45, showing a flock of Knots. This is not a British breeding bird, reaching us as an autumn and winter migrant about August, and often in considerable numbers, as our picture displays. A closer inspection of this bird may be obtained from

Fig. 46, a characteristic study by Mr. C. F. Newall. The summer attire of this bird is vastly different from that worn in winter. In summer the upper parts of its plumage are black and chestnut, with chestnut-red below. In winter, as shown in our illustrations, it is ashy-grey above and white underneath, with dusky streaks and marks on the neck and flanks, as portrayed in Fig. 46. This is an entertaining bird, and when feeding on the mud-flats is often accompanied by dunlins, Ringed plovers, and sanderlings. It runs hither and thither in an active, engaging manner, searching for its food, which is made up of crustaceans, sandworms, molluscs, and other marine creatures. For the most part this is a silent species with us during the winter; but in the arctic regions—where this bird breeds—its note is said to resemble that of the curlew.

In its summer dress this must be a particularly beautiful bird. We get a glimpse of this about May, when birds that have gone further south than our own island during winter are returning to their breeding-stations in the far north; we do not, however, I imagine, see the bird at its very best. Clad in such contrasting colours as black, chestnut, and chestnut-red, and possessing the engaging habits of the sandpipers, it must be a rare treat to see this bird in its summer home. It used to be very much esteemed for the table, and in days gone by was netted in large numbers.

King Canute is said to have been very fond of it, and the specific name of *Canutus* given to the bird adds credence to the story. The poet Drayton refers to this in the following lines:

> The *Knot* that called was *Canutus* Bird of old,
> Of that great King of *Danes*, his name that still doth hold,
> His apetite to please, that farre and neare was sought,
> For him (as some have sayd) from Denmark hither brought.

Four kinds of birds often observed near by, or in company with, the last-mentioned species, may be briefly mentioned in the Dunlin, Curlew Sandpiper, the Purple Sandpiper, and the Sanderling. The dunlin assumes a change of plumage in summer and winter like the knot. In summer it is chestnut-and-black above and black underneath. In winter it is grey above and white below, a great change indeed. When flying, a white bar across each wing is very prominent. This is only a small bird, the female measuring about eight inches. Very large flocks of these birds may sometimes be met with along our coast during the autumn. A number stop for the winter; but a large percentage pass further south, to reappear on their northern journey in the spring. The Curlew Sandpiper may be identified when in flight by displaying its white tail-coverts. It is important to remember this because the winter plumage very closely resembles that of the dunlin. It is then brownish-grey above, each feather bearing a

dusky centre; greyish-white on sides, front of neck, and part of the breast, with dusky-grey streaks; white on remaining under parts. The summer dress is similar to that of the knot, and, like that bird, in the early summer, when the Pigmy curlews—as they are sometimes called—are returning from their winter quarters south of our island to their homes in the north, they may be observed in their rich summer attire.

The Purple Sandpiper is not so abundant, small companies of half a dozen or so being the rule. It exhibits a marked partiality for the rock-girt parts of our coast-line, although on occasions it may also be found on the sand and mud-flats. The winter plumage only need be described. This is sooty above, dark ash-brown on the breast, with faint lines and mottlings on the latter. The food consists of crustaceans, marine insects, and other creatures.

The Sanderling is another bird visitor that makes its appearance in the autumn and stays with us during winter, but does not nest here. It is not a member of the Sandpiper family. It does not, for instance, possess the hind toe of the members of that genus. A small bird, measuring eight inches in length, the winter plumage is ash-grey on the upper parts and white underneath. The migration movements of this interesting little bird —the sole member of its genus—are remarkable. Mr. Hudson says, 'On the Pacific coast of America their

migration extends from the Arctic regions to Patagonia, a journey of nearly eight thousand miles.'

To the young oyster-catcher shown in Fig. 47 attention has already been directed in an earlier part of this chapter. These handsome British breeding birds may be observed during winter along our shores. It should be stated, however, that those birds which nest in the north leave our shores and go further south to spend the winter season; but that immigrants come in from the Continent and take their place.

We may here mention a near relative of the oyster-catcher—the Turnstone. This bird belongs to the plover family, and although it does not nest with us, it is a regular autumn migrant. On some parts of our coast it may be seen all through the winter; on others it is only known as an autumn visitor, passing further south after a short sojourn. This is a small species of nine inches in length, but cannot very well be overlooked on account of its attractive plumage. Generally, the coloration may be described as a mixture of black, chestnut, and brown on the upper surface, and white underneath. The male is more gaudily attired than the female. Owing to its habit of running along and turning over stones and other objects in its search for food, this bird has been called Turnstone. Its other local names are Tangle Picker, Skirl Crake, and Sea Dotterel.

Space compels us to omit a number of species from our survey of the autumn and winter birds of the sea and seashore. We can name only the Bar-tailed Godwit, the Golden Plover, Lapwing, Grey Plover, Hooded Crow, Little Stint, Red-breasted Merganser, several kinds of gulls, &c. From the vast array of geese, swans, and ducks that visit our coasts and mud-flats in winter (especially during severe weather) we can only make a small selection. Prominent among these is the Bean Goose, illustrated in Fig. 48. It is interesting to notice that the Grey-lag is the only goose that nests in the United Kingdom, all the remainder being winter visitors only. Of the latter then, the Bean goose is the most abundant and widely distributed. It chiefly frequents the Scottish coast, but comes further south regularly and in large numbers in a severe winter. To many people these wild geese may perhaps seem very much alike, therefore it should be stated that the species now under consideration may at once be distinguished by the orange-yellow legs and feet, as well as by the orange-yellow on the central portion of the bill and the black at the base and on the nail.

The head and neck are greyish-brown, whilst the general coloration above is dark brown and grey; darkest on the rump, as our artist has depicted. The colour underneath is brownish-grey, merging into white near the tail.

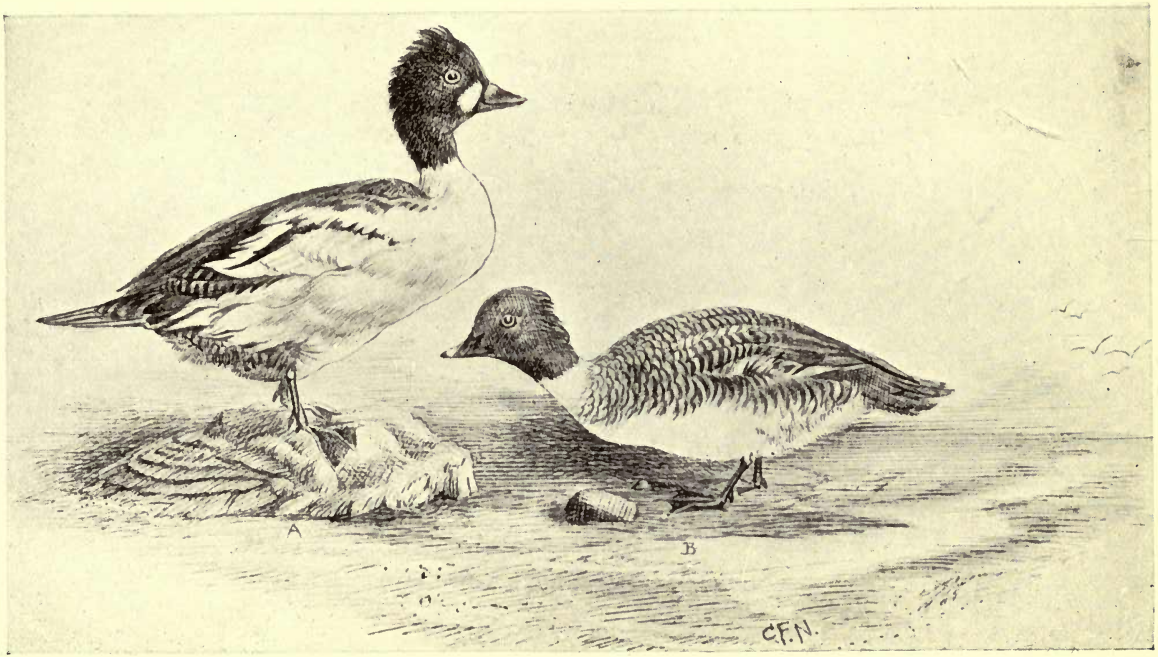



Fig. 50.—Golden-Eye Duck. (A) Male. (B) Female.

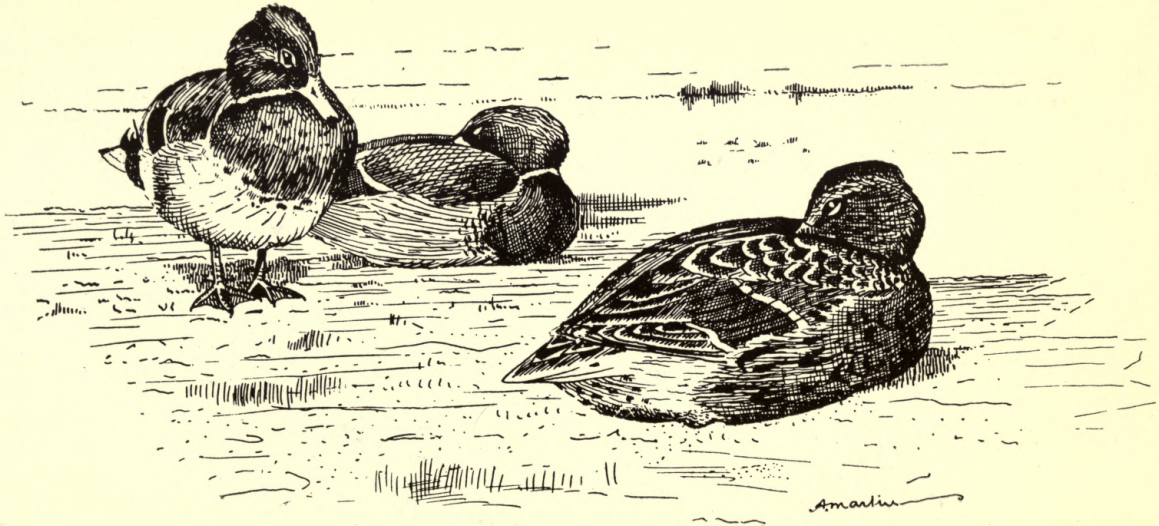


Fig. 51.—Wild Duck,

The Pink-footed Goose is very partial to East Anglia during winter-time, but is also found on the south coast and some parts of the west. It is similar in its general colour to the species last described, but the pink legs and feet and the central portion of the bill (generally, but not invariably) of the same colour, are aids in identification.

The White-fronted Goose is not so common as the two species last mentioned, and although found in large numbers around the Emerald Isle, we must pass on to the two representatives of the Bernacle or Black Geese—namely, the Brent Goose and the Bernacle Goose. The Brent visits us in large flocks, and is to be distinguished from the preceding species, known as Grey geese, by the darker colour and smaller size. Moreover, whilst the Grey geese obtain their food inland, the Black geese feed on the tidal flats. This Brent goose is a late arrival among us, and unless driven south by severe weather will not venture farther down our coast-line than is absolutely necessary, the question of an adequate food supply directing its movements. The bill, head, throat, and neck are black, with the exception of a small patch of white on either side of the latter; brownish-black mantle with edges of rufous-brown; black wing-feathers, rump, and tail; white coverts; black on upper breast; slate-grey on lower breast and belly; black legs. Whilst the Bean goose measures thirty-four

inches in length, the Brent measures twenty-three inches only.

The Bernacle Goose is larger than the Brent by about a couple of inches, and it is more locally distributed. The plumage need not be detailed, the white face which this species possesses being sufficient to identify it at once. The Brent goose feeds by day, but most of the other species that have been mentioned, at night. These are gregarious fowl for the most part, and feed largely upon grain and grass. All of them are strong fliers and good swimmers. Their curious and weird notes may often be heard at night by those living inland as a company of them pass overhead. The Brent calls 'honk,' or 'hank,' whilst the notes of the other species have been referred to thus: Bernacle goose, 'halm, halm,' or 'a what'; Bean goose, a trumpet-like 'clank'; Grey-lag goose, a loud 'gag-gag,' or 'gaggle.'

Wild Swans always cause quite a stir among country folk when seen flying overhead during winter, and when these birds are observed at that season the probability is that a Whooper or Bewick's Swan is the species seen. The Whooper calls 'hoop,' its note being compared with the bass notes of a trombone, and in winter a further loud note is uttered, something like 'khoo, khoo, khoo.' Bewick's Swan calls 'yap-yap-yap,' 'tong,' or 'a-kloong.'

The Whooper is pure white, like its relative the Mute

Swan, known to every one. It is not, however, such a graceful bird as the latter, and carries its neck almost straight. It is mostly found off the Scottish coast during winter, but visits other portions of our coast-line on occasions. It is almost herbivorous, but will not disdain insects and molluscs. It is interesting to observe that the Whooper pairs for life. It does not nest with us, the Mute swan of our ornamental sheets of water and rivers being the only species we can claim in this respect.

Bewick's Swan is also pure white, but is a smaller species than the Whooper, the former measuring sixty inches and weighing about twenty-four pounds, and the latter measuring about forty inches only. Beyond this, Bewick's Swan is of a more gregarious character than the Whooper, and in favourable situations the birds may be counted in thousands. Those who have never seen such vast companies of pure white swans have no idea of their attractiveness and beauty against the background of black mud, and it is mostly left for artists to give us some idea of that charming picture in birdland.

Another bird with which the student of ornithology will make acquaintance by the seashore during his winter pilgrimages is the Common Scoter. Both male and female are shown in our next illustration (Fig. 49). This bird nests with us in small numbers in Scotland. The male, or drake, as will be observed, is almost black in colour;

the female is brown. Beyond this, the conspicuous knob at the base of the bill in the male is well shown in our illustration. It will be seen that the female does not possess such a prominent one. The bird is twenty inches in length, and the male has a bright orange ridge on the upper mandible which relieves his black plumage. This is a typical marine duck and an expert diver. In winter it visits our shores in immense numbers, and is the most common sea duck we possess at that season. The Velvet Scoter may sometimes be seen in company with the last species, but is much less common. It may be distinguished by the white speculum in both the male and female.

The Widgeon, the handsome Pochard, the Tufted Duck, and the Scaup Duck are all common residents along the flat portions of our coast during autumn and winter, as also the Golden-Eye, shown in Fig. 50. This pretty species inhabits inland waters, but during severe weather resorts to the neighbourhood of the coast. The drake (see A in Fig. 50) has a glossy green-crested head and neck, with a prominent white spot near the base of the bill; the back is black, remaining parts white. The irides are golden-yellow, and it is from these its English name has been acquired. The duck is greyish-brown on the head and neck and the white spot is absent. Curious to relate, the male in summer assumes the garb of the female. Another interesting

point in connexion with this duck is that it nests in trees, laying in a hole ten or twelve bright greyish-green eggs.

The last species on our list is the Wild Duck (Fig. 51). Whilst this handsome bird mostly resorts to inland waters it may often be observed in the vicinity of the sea and seashore, and therefore claims a place in our story. This is a night-feeding bird, and although exhibiting a marked preference for fresh water, is omnivorous in its tastes. During the daytime it will float peacefully upon the sea in the neighbourhood of its feeding-grounds, or seek repose on some sheltered bay, or quiet spot far from the madding crowd, as depicted in our illustration.

This is a wary bird, and the wild fowler has to employ great strategy to approach him. The drake is very beautiful when seen at his best, very different from the caricature seen in a poulterer's shop suspended by a dirty piece of string. One most interesting trait in this bird's character must be mentioned before we pass on. When the nesting-season is in full swing, and just when the duck needs the presence and attention of the drake most, he forsakes her and goes into hiding! He then moults his feathers, and eventually comes forth in the garb of the female! This plumage is assumed until the autumn, when a further moult takes place, and the handsome dress known to almost every one is again put on.

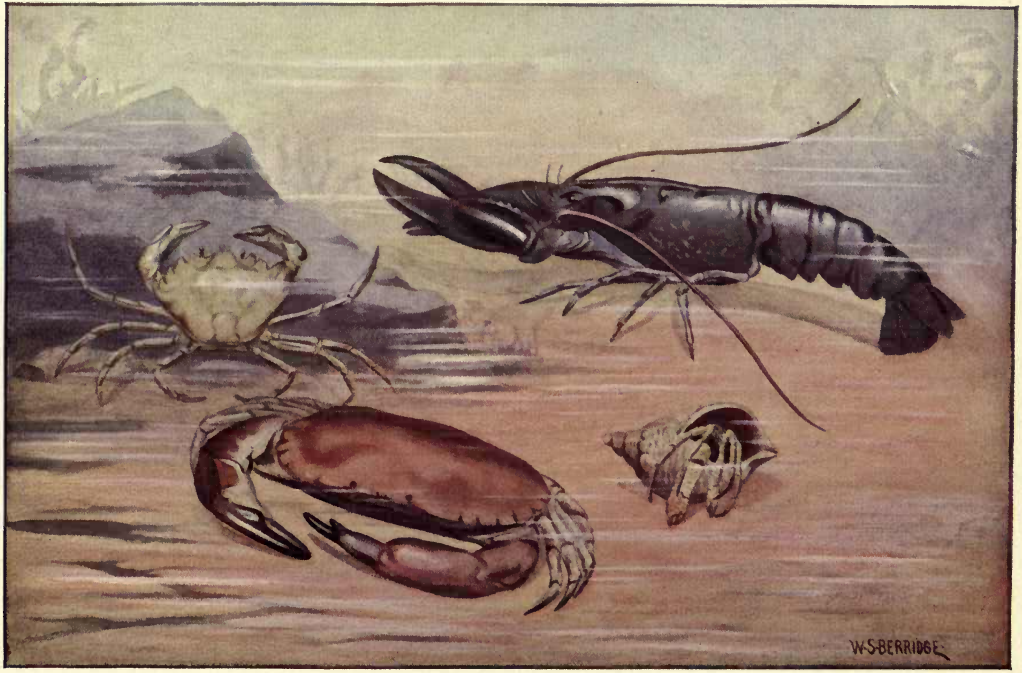
## CHAPTER VI

### CRUSTACEANS; OR, LOBSTERS, CRABS, PRAWNS, SHRIMPS, SANDHOPPERS, AND BARNACLES

If our ramble along the seashore be taken to a haunt like 'A Rock-strewn Shore' depicted in Fig. 52, we are sure to meet with several representatives of the interesting animals which now claim attention.

It is astonishing to notice the amount of marine life that may be observed *when one looks for it* along these rocky stretches of our coast, especially soon after the tide has gone out and left a number of sea folk who have to wait for the incoming tide before being in their own free element again. Several shell-fish will be encountered during our seashore pilgrimage, but these will be considered by themselves in the next chapter. Our present task is briefly to consider the biographies of several well-known marine forms of Crustacea, edible and otherwise. First comes our friend the Lobster, a faithful representation of our common species known by sight to almost every one appearing in Plate V., Fig. 2. All the species now to be considered belong to the Crustacea. Several members of the class

PLATE V.




1. Common Shore Crab (*Carcinus maenas*).
2. Common Lobster (*Homarus vulgaris*).
3. Edible Crab (*Cancer pagurus*).
4. Common Hermit Crab (*Eupagurus bernhardus*).

p. 188.

are remarkable in form and colour, and when intelligently studied, their structure and habits are very wonderful.

The true Lobster (*Homarus vulgaris*) is a very near relative of the fresh-water crayfish (*Astacus fluviatilis*) which exists in such large numbers in many of our rivers and streams. Whilst at low spring tides, between tide-marks, the first-named may be found by the diligent seashore naturalist inhabiting the deeper pools, it is a case of eyes and no eyes if success is to be achieved. This is not, however, an inhabitant of very deep water, and is usually found off a rocky coast. From what the fishermen say—and who should be better acquainted with their habits than they?—lobsters do not shift their quarters to any extent. They stick to a haunt much after the manner of the kingfisher along its favourite stream side. Whilst the general coloration of the true Lobster is brownish-blue, with a marbling of white, contrary to general opinion, full-red varieties have been recorded. It is well known that when boiled the lobster assumes the scarlet colour seen upon the fishmonger's slab, but it is incorrect to imagine that red varieties have not been met with in a living state.

It seems to be agreed that the continual capture of lobsters has greatly decreased their numbers around our own coasts, and this is more remarkable when

it is borne in mind that the female lays from twenty to thirty thousand eggs at a time. These are not deposited by her until they are hatched. When the young lobsters emerge from the eggs they are weak little creatures, but somewhat resemble the adult in general form. They soon gather strength, however, and are active and good swimmers. Indeed, for a few weeks the baby lobster follows a life of restless activity. Then its agility ceases, and the youngster sinks to the bottom of the ocean, and there follows the somewhat sedentary life of the adults. From five to seven years are occupied by the lobster in attaining its majority, or perfect form, and during this time the shell is cast a number of times. It resorts, as it were, to a process of moulting, and this takes place very frequently during the early portion of its life, and less often as it grows older. When the old shell is discarded the body is soft and defenceless, but after a time it hardens in the manner known to most people. The metamorphosis through which the lobster passes is a most interesting and wonderful life-cycle, and if we trace the history of the creature from the egg to the five-to-seven-year-old adult, a whole series of facts are disclosed of a very remarkable character. The salient features of the true lobster may thus be given: A short rostrum, bearing three teeth on either side and none below; rounded eyes; very large chelipeds (or great claws),

having four or five large conical-shaped teeth on the upper border of the wrist.

The substance that envelops these crustaceans may be likened to that borne by some kinds of insects, and those who have read my *Story of Insect Life* will remember that I there described this hard covering as chitin. The coat of mail, therefore, gives to the Crustacea a distinct and definite character. This class of sea and seashore animals may well engage the attention of the young naturalist, who will soon be able to recognize, and with a degree of certainty, their usual characteristics, and not be puzzled by the variability which animals of a soft-bodied nature exhibit.

When frightened or interfered with the lobster has the habit of discarding its great claws, but these only. On the other hand, the crab possesses the power of throwing off any one of its legs, these all being specially adapted for this purpose.

We recommend the reader to consult Miss Newbiggin's *Life by the Seashore*, which gives detailed accounts of marine life. She states that 'separation always takes place at the one point, and the fusion of segments is to be regarded as a special adaptation to facilitate this *autotomy* or self-mutilation. In this respect also, therefore, the crab shows an increase of specialization as compared with the lobster.' The lobster's main power of locomotion lies in its tail, and

this is made up for the most part of strong muscles. Whilst at first sight it may be thought that the crab does not possess this appendage, if placed on its back the smaller tail will at once be observed. This, however, does not bear any muscles, and is of no service to the animal for locomotive purposes. Whilst the lobster and crab are to be regarded as typical creeping animals, the first-named can by means of its tail dart *backwards* with considerable swiftness.

On some parts of our coast the Rock, or Spring, lobster is found. It resorts chiefly to the south and west of England, and also occurs off the Irish coast. Whilst in many respects its general resemblance to the true Lobster is very noticeable, structurally it is a very different creature. It is reddish-brown in colour, mottled with white. On seeing this animal for the first time, however, the observer will at once be struck with the fact that this species does not possess the characteristic great forceps of the creature depicted in our frontispiece. Its very long antennae and other distinguishing features need not be detailed here. The food mostly consists of small molluscs, which are found around the rocks it is so fond of frequenting. It is interesting to notice also that this lobster is one of the few crustaceans which have the habit of emitting any audible sound! This is caused by rubbing together sharp portions of the antennae.

Fig. 52.—A Rock-strewn Shore.

Fig. 53.—River Murray Lobster.

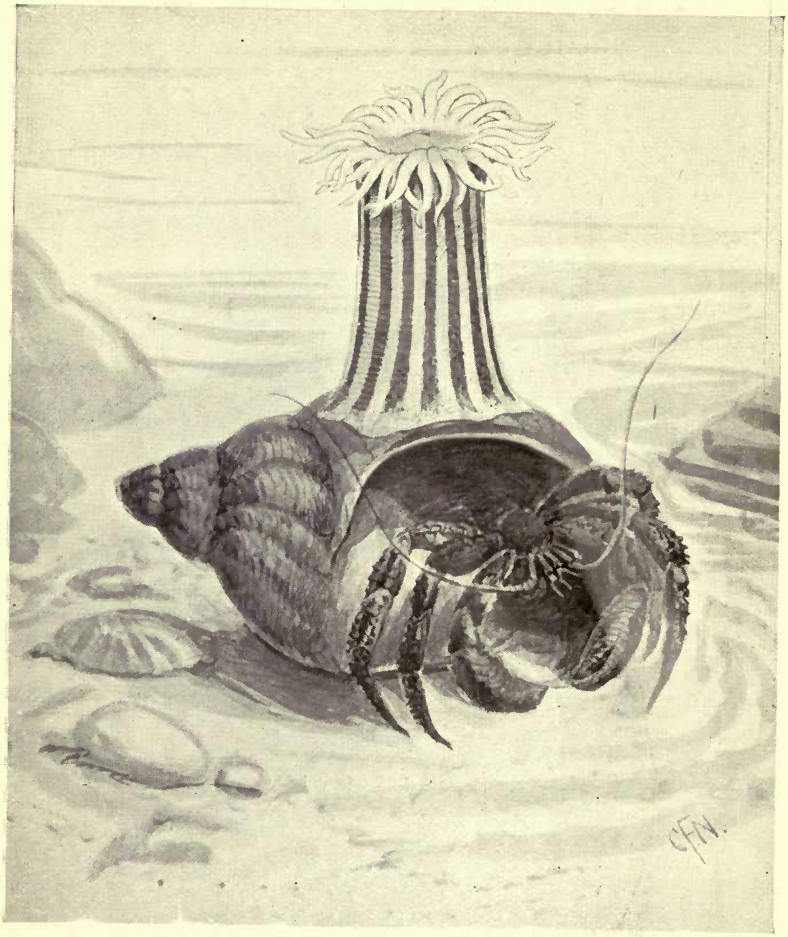


Fig. 54.—Hermit Crab, with Anemone attached to its Shell (*Sagartia parasitica*).

As a comparison of general form and structure, attention is directed to the coloured figure of the Common lobster in our frontispiece with the photograph of the River Murray lobster shown in Fig. 53, an Australian species of much interest.

Lobsters breathe by means of gills, like a fish ; and it is an entrancing sight to watch one of these sea-creatures when resting constantly moving its second maxillae for the purpose of setting up a current of water. It is essential that the gills should be constantly washed. This result is gained, when swimming, by the movement of the animal's body ; but when resting it would be asphyxiated were it not for the action of the maxillae. The forceps of the lobster are weapons of offence and defence, and when these and other similar crustaceans engage in combat, limbs are frequently lost.

When walking along the seashore you may be fortunate enough to espy what you take to be a crab in a shell ! On seeing the creature for the first time you may imagine that your eyes have deceived you, but closer inspection will tell you that this is not so, and that you have discovered a specimen of the well-named Hermit crab. Two excellent representations are given in Figs. 54 and 55. Fig. 54 is exceedingly interesting, because it shows us not only the Hermit crab in a shell, but an anemone firmly attached to the top of it. Here is an excellent example of two animals

taking advantage of another. The Hermit crab has taken possession of the home of some shell-fish, and the anemone has riveted itself to the outside of the shell, and is carried about by the crab wherever it may chance to wander. This beautiful sea anemone always selects a shell inhabited by a Hermit crab whereon to attach itself. These Hermit crabs, then, take up their abode in the shells of various shell-fish. They possess a soft, unsymmetrical tail that has lost most of its appendages with the exception of the last pair. These during the course of time have lost their original functions as swimming-organs, and have developed into hook-like structures by means of which the Hermit secures himself inside his home. Hermit crabs form a connecting-link between the true crabs and the lobsters. It is not yet accurately understood whether the *disused* and *untenanted* shells of the whelk and other shell-fish are invariably taken possession of. Some observers are of opinion, however, that as the Hermit is frequently found tenanting fresh shells, possession is taken by force, the crustacean fighting the rightful tenant and actually eating its body out of the way! Although our illustrations well display the shelly covering which the head and other portions of the body bear, on taking a Hermit crab from its adopted hiding-place we find that the hind parts are soft, bare, and without any means of protection.

This is an active crab, and its stout second pair of legs are used for walking. It is an interesting sight to observe one of these sea folk walking along the beach and carefully examining the empty houses of shell-fish for the apparent purpose of finding a better and more suitable home! Sometimes the curious creature will select a large shell where there is ample room for it to grow; and when it does decide upon a change of residence, the removal is carried out with great rapidity and precision. On occasion, however, the Hermit is not left in undisputed possession of his chosen homestead, for another individual may come along and offer fight. A pitched battle ensues, and the tenant of the shell may be pulled unceremoniously from his home, in which case the conqueror at once pushes his tail into the shell and defies the vanquished Hermit to oust him from the citadel! A coloured illustration of this species appears in Plate V., Fig. 4.

We now come to the Edible crab shown in the frontispiece to this chapter, Fig. 3. As is well known, the cephalo-thorax of this crustacean is very broad, but the tail is very much reduced—so much so, indeed, that it is of no service as a swimming-organ. Whilst the lobster is mostly sedentary in its habits, the crab is still more so; indeed, this animal only possesses the power of crawling, and passes its existence among stones and weed. It has not such long antennae as the

lobster; its eyes are sunken, and thus protected from harm; the gills are better protected, and the mouth-organs are much more modified. Then again, whilst the lobster has more than one pair of legs that bear terminal forceps, the crab only has the first pair thus modified, the remainder being pointed only and utilized for locomotion. The first pair are always the largest, and comprise the chief weapons of offence and defence. The flat carapac, or shield, of the crab is well known; and this flattening, as it were, of the main portion of its shelly covering results in various structural differences as compared with the lobster and the prawn.

To follow the general life-habits of crabs further, we may now devote attention to the little Shore crabs which are so abundant on some parts of our coast-line. I remember a year or two ago watching hundreds of these on the Kentish coast near Whitstable, and a most uncanny and yet interesting sight it was. The tide had gone out some distance, and left stranded upon the pebbly shore large numbers of these Shore crabs, winkles, mussels, whelks, and other forms of marine life. In the quiet of a summer evening (in a haunt somewhat like that depicted in Figs. 57 and 58), I stole down to the beach, and the curious rattling noise made by dozens of these crustaceans as they scuttled over the stones at once attracted my attention. The little creatures were here, there, and everywhere; and so engaged was

I in my innocent occupation that I did not notice the approach of a buxom Kentish girl of about sixteen summers, who incorrectly imagined I was poaching among these rich preserves! Without any ceremony the girl abruptly informed me that I was trespassing upon sacred ground, and that I had no right to wander at will upon the winkle-beds! Her brother, she said, was the watcher over this particular part of the Whitstable fishing-ground, beyond which he was the champion winkle-picker of the neighbourhood! Assured that I was only watching the Shore crabs in their interesting manœuvres, my young friend was relieved, and allowed me to remain among the winkles to pursue my operations. How condescending, to be sure! What struck me about the crabs was that no two seemed to be going in the same direction or travelling in exactly the same manner. Whilst some individuals were almost as small as a sixpence, others would cover a half-crown, and others a florin; a few were larger still. But what artful sea-folk these are! Some I captured and placed on a sandy tract of shore, or in one of the little pools left by the receding tide. In less time than it takes to tell the story every one of them had buried itself in the sand, and if I had been offered a thousand pounds I could not have located one of them, the creatures disappearing before my eyes! I was fortunate, also, in observing two or three couples

engaged in combat. What they were fighting about was not apparent to me, unless they had got in one another's way. Others were occupied in sexual union ; but, what was still more interesting to me, I found what I took to be two crabs lying snugly ensconsed close to one another, and living apparently in perfect harmony. How comes this ? I thought. I picked up the more likely-looking specimen of the two, and to my surprise it refused to kick and struggle, and I did not receive what I quite anticipated—namely, a nasty nip. A terrible struggle, I imagined, had taken place between these two sea-folk, and I was thinking of mourning my untimely appearance upon the scene when I chanced to notice a split in the shell of the creature I held in my hand. Then the truth dawned upon me. I dropped the creature I held, and caught hold of the other one. It kicked and showed fight in no uncertain manner ; but what was most interesting of all was that it did not possess a shell, and was soft to the touch. There was the secret in a nutshell ! This second specimen had only just cast its shelly outer covering, and I had been handling its discarded carcase ! The reader may well imagine the fund of amusement this little episode caused me on that silent coast on a summer evening. I felt I had been well fooled, to say the least. I placed the soft body of my crustacean in a little pool of water, and the ingenious creature at

Fig. 55.—Hermit Crab.

Fig. 56.—Northern Stone Crab.

Fig. 57.—A Passing Storm.

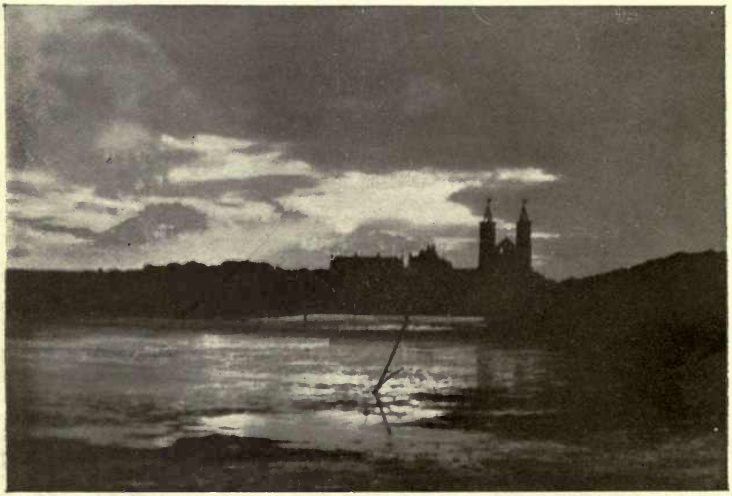


Fig. 58.—A Stormy Sunset.

once commenced the wonderful process of irrigating the water, it being essential that a current of fresh water should be set up in the same manner as in the lobster. When witnessing this performance for the first time the observer cannot fail to be impressed, more especially when he has been remarking, perchance, upon the ungainly antics of the Shore crabs on the beach.

The biography of a Crab may thus be told. A hole is made in the sand by the female in which to lay her eggs. Having deposited the eggs, she, like the cuckoo among birds, takes no further heed of them! When hatched, the baby crab is enveloped in a loose, transparent skin; but in a short time it frees itself, and comes forth in the garb of a minute, comical creature, vastly different from the adult. Nevertheless, it is thus early a good and free swimmer, and this is accomplished by means of the long tail and legs. The sides of the body are covered with a loosely fitting shell; the youngster bears two large prominent eyes; a long appendage on the nose; but, what is more curious still, a sort of cap upon its back. When in this stage of its existence the curious little creature is called a Zoea, and swims, eats, and grows, and casts its skin regularly. After each casting, or moult, fresh organs appear, and some portion of the babyhood functions disappears. A further succession

of changes occurs, and then we begin to see the form of the adult crab evolving; but for some time the little crustacean has to have all his wits about him to escape from numerous enemies who beset him. His relatives may pounce upon and devour him, he may unconsciously be entrapped in the outspread tentacles of a sea anemone, and in other ways the little crab passes a precarious existence. Eventually as the creature grows its shell is thrown off, and with each successive moult it becomes larger and stronger; but whenever the old shell has been cast it has an anxious time in view of the many marine folk who consider a soft-bodied crab a delicious morsel. The Shore crab is more or less green in colour, and is as a result often called the Green crab.

The Spider crabs are inhabitants of deep water; they possess long, slender legs, and are characterized by their laborious and measured movements. They have wonderful devices for protective and stalking purposes.

Although frequently referred to as a Spider crab, the Northern Stone crab (see Fig. 56) is much more closely related to the Hermit crab already described. This species is a resident of northern waters, and attains a large size, specimens spanning twenty inches and measuring four inches across the carapac being recorded. The spiny coating upon the shell of this

interesting northern species is well exhibited in our illustration, as also the long, spiny legs. The limpets at the back of the crab—upon the stone—are also worthy of examination. A detailed description of the distinguishing features between the Spider crabs and the Northern Stone crab (*Lithodes maia*—relegated to a family of its own known as the Lithodidae) would only burden the reader. Although at first sight the species shown in Fig. 56 may be considered as one claiming rightful kinship with the Spider crabs, a careful examination will reveal salient characteristics to which I invite the young naturalist's own observation and research.

The reader has probably heard of toads being said to be found alive embedded in solid pieces of rock, stone, and other substances, and it appears that this stupid assertion having been so constantly exploded as ridiculous, attention has now been turned to our friend the crab in this respect, as the following incident will show.

A crab was said to have been found embedded in a rock in Nottingham, and was deemed to be several thousand years old ; but it turned out to be an impostor. It was, on examination, found to be quite juvenile and by no means a wonder. The fact was elicited that a boy brought the crab from Mablethorpe, and had thrown it, while alive, into the foundations of the

house where it was discovered. It had evidently either hidden in a crevice, or had been covered by the loose sand, which was separated from the soft bunter rock, and was brought to light by a workman engaged in excavating. So ends another legend.

The following example shows the extraordinary distance one of these crustaceans travels. In his report for the quarter ended September 30, 1907, the fishery officer for the North-Eastern District states that he received one marked crab during the quarter. It was captured at Boddin, close to Montrose, Scotland. It had travelled from four miles north of Scarborough Castle, a distance of about 155 miles, in 689 days. Unless the crab had a lift on the way from some sportive person, it must, on the average, have crawled not less than 330 yards a day.

Four other animals claim attention in this part of our story: the Prawn, his near relative the Shrimp, the Common Sandhopper, and lastly the Acorn Barnacle.

The Prawn is well illustrated in Fig. 59, No. 1, and as the Shrimp is figured on the same plate, a useful and interesting comparison between the two may be made. These prawns and shrimps are closely related to our friend the lobster; indeed, if the reader chances to be in the neighbourhood of a rocky coast, and will there examine some of the little pools left by the receding tide, he will be able to catch a prawn

and see the likeness for himself. If he cannot do this, our black-and-white drawing will show how like this crustacean is to the lobster already described. In the former case, however, you will need to have your wits about you and use your eyes to advantage, for in a living condition prawns are practically colourless and almost transparent. When in the water it is difficult to locate the wary creatures as they dart about, but by a careful look-out a glimpse may perchance be caught of their glistening eyes. Having captured a specimen, you will at once be able to see that the living animal differs a great deal from the boiled specimens seen at the fishmonger's.

These prawns are trim, elegant, clean, and useful inhabitants of the sea. They feed upon the dead bodies of various kinds of animals, and so help to keep the water clear of the filth which would accumulate but for the labours of these crustacean scavengers. Like many kinds of insects who also resort to putrid carrion, such as the Sexton beetle and others (as set out in detail in my *Story of Insect Life*), the prawn is very particular about the cleanliness of its body. The toilet is carried out by means of the front legs. An examination of these will reveal the presence of rigid hairs, and, as these stand out stiffly, the animal is able to brush its body, as it were, almost all over. Even if its front pair of brushes fail in this respect, it can

fall back upon the pincers situate upon the second pair of legs, these being admirably depicted in Fig. 59.

If the reader will refer to this plate, and examine the heads of the prawn and the shrimp, he will see a part of the anatomy that will at once tell the difference in structure between the two creatures. In the first a long spike projects from the edge of the shield that covers the back. If the edge of this spike, or beak, bears sharp little teeth, it is a prawn; but if no teeth are present, and the spike is quite smooth, it is a shrimp.

As regards the latter, the general form and structure are well known to almost every one when purchased from the fishmonger, but it is our desire to study this creature in its natural condition. In the pools, then, you will find not only prawns and other interesting sea folk, but also a large number of shrimps. Like the prawn, the body is transparent and difficult to locate. It is a case of eyes and no eyes, as in so many other departments of natural history study and research. Beyond this, these common sea inhabitants have the habit of sinking into the sand in a very ingenious manner, and they are also protectively coloured when lying upon the sand, their speckled bodies almost exactly matching their surroundings. The long antennae which both the prawn and the shrimp bear are well shown in our illustrations, as also the similarity in the

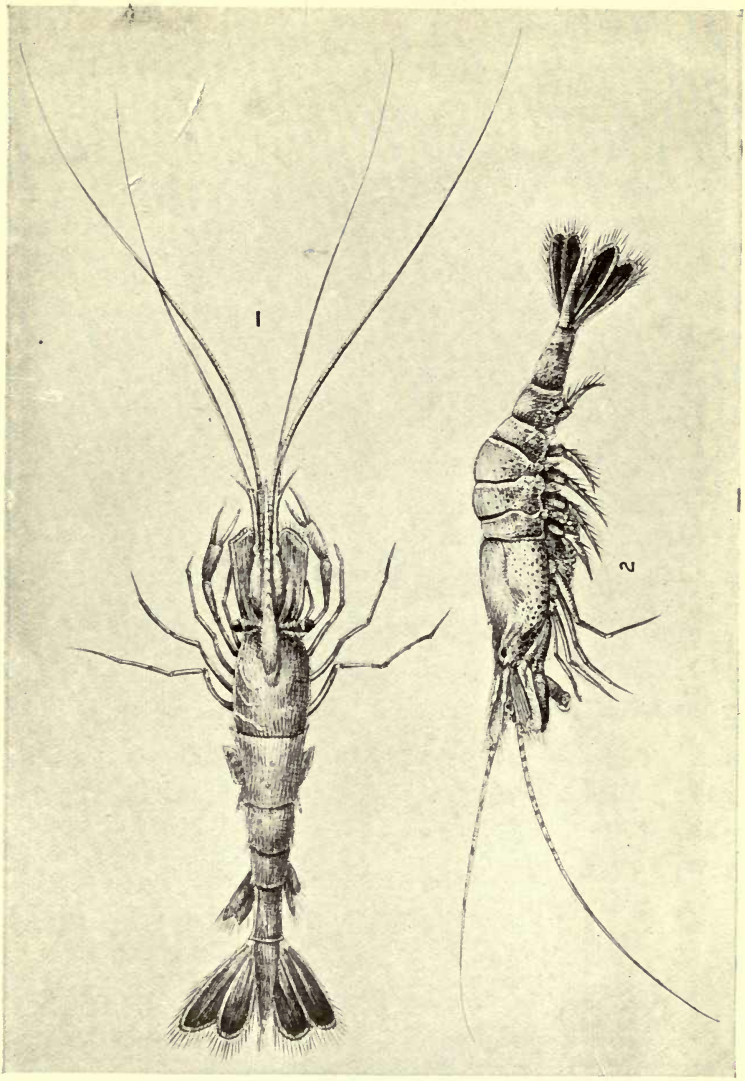



Fig. 59.—1. PRAWN (*Palaemon serratus*). 2. SHRIMP (*Crangon vulgaris*).

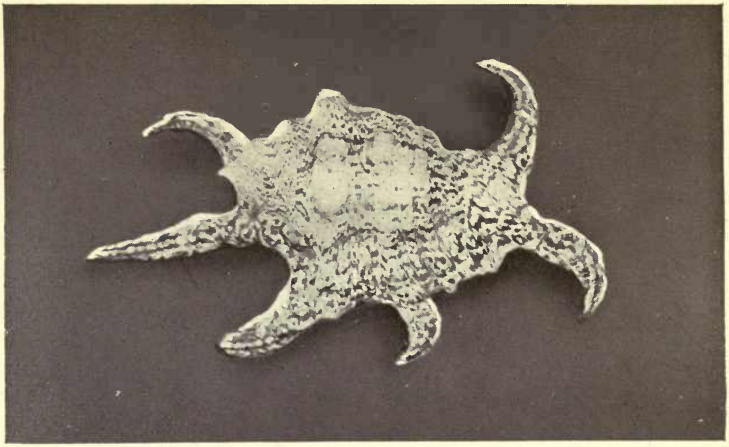


Fig. 60.—Mauve Scorpion.

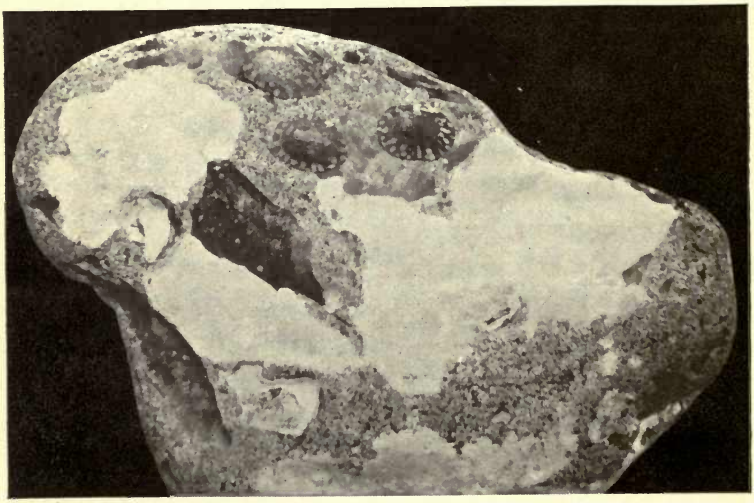


Fig. 61.—Three Limpets on a Rock.
Note the protective coloration.

structure of the tail. The shrimp, like the prawn and the lobster, changes colour when boiled.

Closely allied to the latter is the remarkable little Sandhopper. This common inhabitant of the seashore cannot escape notice, not only on account of its skipping feats, but also because of its immense numbers. It performs its prodigious leaps by doubling up its body and then releasing it suddenly like a spring. When one remembers that birds, crabs, various insects, and other creatures take heavy toll from the sandhopper's legions, it is wonderful how the agile little being manages to keep up its battalions; but that it does so every visitor to the seashore will be able to testify. This is a useful scavenger, one of Nature's sanitary agents, living as it does upon practically anything that happens to be stranded upon the shore, and thus clearing away a mass of putrid matter that would otherwise be the reverse of healthy or pleasant. In colour the Common Sandhopper is yellowish white, or a dark, dirty tint.

When I was in the North of England last autumn I enjoyed a forty-mile tramp in one day, and almost rivalled the pedestrian performances of my friend the Vicar of Filey in this respect! I remember that during the course of that long walk—commenced at 9 a.m. and finished at 10 p.m. with only an hour's rest—we came upon some near relatives of the Sandhopper in the

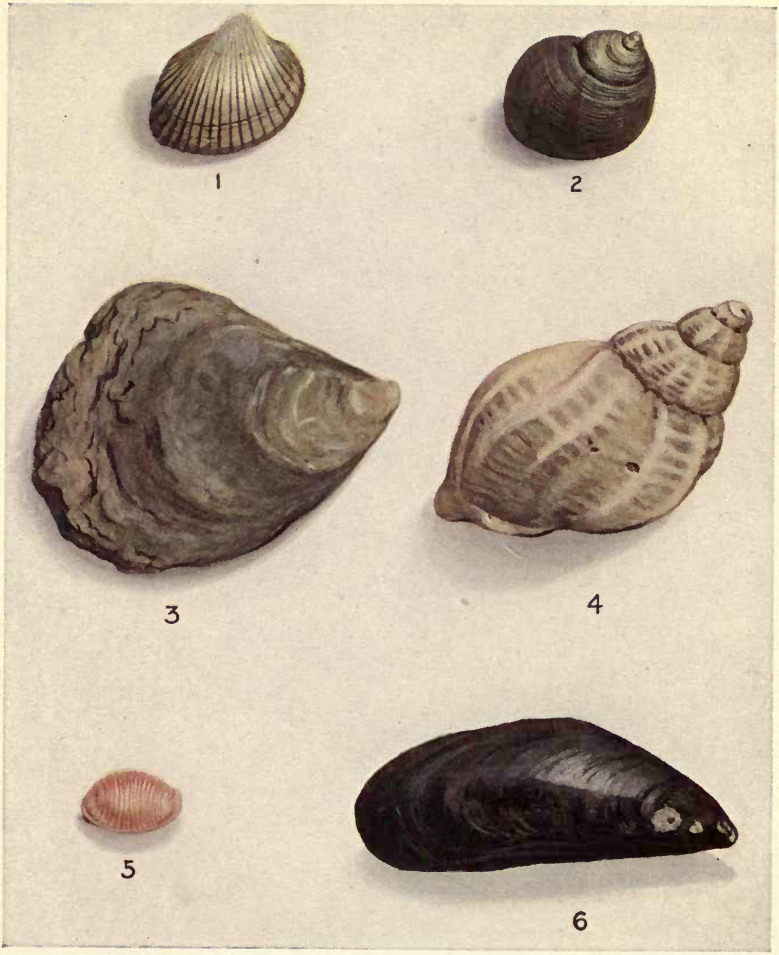
person of a remarkable member of the *Isopoda*. Never in the course of my peregrinations have I observed such wonderfully quick and active creatures. Mr. W. J. Clarke tells me he has never yet been able to catch one alive, and I can well believe him in view of the way in which the extraordinary Isopods eluded our grasp on the aforesaid occasion. The creature is about an inch in length, and greyish-brown in colour. No matter how quick one may be, it seems a sheer impossibility to capture one without smashing it (and even in this respect I was unsuccessful); and if any wild folk feed upon these extraordinary flat-bodied creatures, then we must certainly admire their amazing dexterity in catching them, and I would give much to observe them in the act!

One more inhabitant of the rocks or woodwork left high and dry by the tide, or of the rock-pools where I have invited you to carry out your explorations, must be referred to in conclusion—namely, the Acorn Barnacle. These remarkable little creatures may be counted in huge numbers, and give to their environment a most extraordinary appearance. At first sight one might imagine that the barnacles were lifeless, but touch one and you will at once observe that such is not the case. Be careful, however, how you caress these tiny marine folk, for if you happen to slip, and thrust out your hand on to a rock for support, you will find that the ridges

of the barnacle's shell cut as sharp and clean as a keen-edged razor. These Acorn barnacles are not distantly related to the shrimp and sandhopper, but what a different life is theirs! Instead of having free access to the shore and the water, swimming and leaping as shrimps and sandhoppers are wont to do, once having become attached to a position upon rock or woodwork the barnacle is there for life! During their babyhood, however, they do for a brief span enjoy a free existence. At first they are called 'zoeas,' like the young crab, and are quite unlike their parents. They possess a large black eye in the centre of the body, and three pairs of minute legs. By means of the latter they are able to swim in the water. A continual casting of the skin takes place, and as each successive 'moult' ensues, so the form of the baby barnacle changes. Having turned itself inside out, as it were, a large number of times, the remarkable little creature eventually decides to select some rock, post, pile, or other situation, and there to retire for life! When it has chosen a site, the barnacle fastens upon it by the aid of its feelers. This accomplished, a sort of cement is emitted, and this substance hardens around the body and so secures safe anchorage for the clever little sea animal. Again the skin is shed, and at last the adult form is assumed. Still more remarkable to notice, the last 'moult' results in the eye being lost, and for the

remainder of its life the creature is blind! Not only are the situations already mentioned chosen by these Acorn barnacles, but they fasten themselves upon the bodies of various shell-fish and crustaceans. When sunning themselves during the time the tide is out, one does not see these animals at their best—for that we must watch them engaged in fishing in the water. The limbs bear fringes of hairs, and are thrust out of the little hole at the top of the shell in a very dexterous manner and then drawn in again. In this way the wary barnacle feeds, catching as it sweeps its hairy limbs through the water small portions of matter which support its life.

PLATE VI.




1. Cockle. 2. Winkle. 3. Oyster. 4. Whelk.
5. Cowry. 6. Mussel.

p. 215.

## CHAPTER VII

### MOLLUSCA, OR SHELL-FISH

THOSE whose good fortune it is to sojourn by the silver sea—and especially where rocks abound—cannot fail to have been interested in the Molluscs or Shell-fish there found. Doubtless the reader has on many occasions examined with great interest the wonderful little animals which construct such marvellous shell-homes, and desired some information respecting their life and habits. Who, for instance, on visiting some part of the British coast, has not picked up cockles, whelks, oysters, mussels, and other shell-fish, and endeavoured—often in vain—to detach from their strong-holds limpets and barnacles at low tide? Many a pleasant hour may be spent making observations upon these interesting inhabitants of the sea. Whilst it has been my aim in this story to deal with British species, in the opening pages of the present chapter I have thought it well to give pride of place to some very wonderful and beautiful representatives of the Mollusca, or Shell-fish, from other climes. Figs. 60, 62, 63, 64, 65, 66, and 67 are photographs of specimens in my

own collection and these excellent representations will convey to the reader some idea of their beauty and marvellous form and structure.

All the animals belonging to the Mollusca have soft bodies, these being often encased in a hard shell. These animals possess no skeleton, the shell itself being only a protection for the body of the owner. For the most part, Molluscs do not have limbs as generally understood. Their bodies are flabby, with a soft skin, which frequently hangs round them in thick folds. These folds form what is known as the 'mantle,' and as an instance may be mentioned the well-known and much-eaten oyster. How often on examining a shell —whether tenanted or tenantless—has the reader marvelled at its construction! Even with the simpler and commoner forms of shells this wonder is borne home to the observer, but how much more when one examines some of the magnificent shells found in tropical seas!

Shells are formed from lime, which the animal obtains from the water in which it makes its home, and this it spreads around its body by means of the 'mantle' in layers on the inside. When the oyster, for example, is very young, it does not exceed in size the head of a pin, and the shell at this stage presents the appearance of a transparent bead. As the young oyster grows, however, it is necessary that his house

should be enlarged, and the creature thereupon stretches out its 'mantle' until it reaches over the edge of the shell. From out of the 'mantle' oozes a very thin fluid, in which are secreted minute particles of lime that have passed through the creature's body. Then the thin film of fluid adheres to the inside of the shell, spreads over the edge, and, forming a new layer of limy substance, adds a new rim to the shell. This rim is frequently white inside, but is often covered with small cells of coloured or dark pigment which are also produced by the mantle.

When the shell has reached due proportions no further deposit is made until it is again necessary for the creature to increase the size of its residence, and then the process already explained is once more resorted to. In this way a shell grows, and thus do all Molluscs construct the wonderful homestead in which they live.

From peculiarities of the mantle arise the different shapes, colours, and other characteristics of various shells. Where the sunlight is very bright—as in tropical seas and shallow water—shells are more brilliantly coloured than those found in deep waters, or in those parts of the world where the sun does not shine so brightly.

Before dealing with the subjects illustrated, it will be interesting to state how a pearl is produced. Supposing a small grain of sand or some similar hard

substance finds its way into the folds of the mantle—as happens in the case of some oysters and mussels—the mantle sets to work to allay the irritation caused by the grain of sand or other substance, by surrounding the irritating substance with layer upon layer of lime, and in this wonderful and yet simple manner a pearl is eventually produced!

The Mauve Scorpion (Fig. 60) is closely allied to the 'Pelican's Foot,' found on the British coast, and its singular form will at once arrest attention. The tenant of this curious home is very much like the far better-known snail, and can draw the whole of its body into the shell when necessary. The species illustrated is for the most part an inhabitant of the West Indies and the coast of China.

The Pearly Trochus (Fig. 62) is a most beautiful shell, and our illustration can only convey a poor impression of its intense loveliness. As will be observed, it is pyramidical in shape, nearly flat at the base, and tapering gradually to a point. There are seven 'stories' in this remarkable mollusc, the four upper 'stories' somewhat shallow and the three lower 'stories' much deeper. Inside the shell is pearly white; outside, when the outer coating has been taken off, the beautiful iridescent colours are almost beyond description. The owner of this lovely home is an inhabitant of shallow water, and lives mostly on seaweed. Some species of

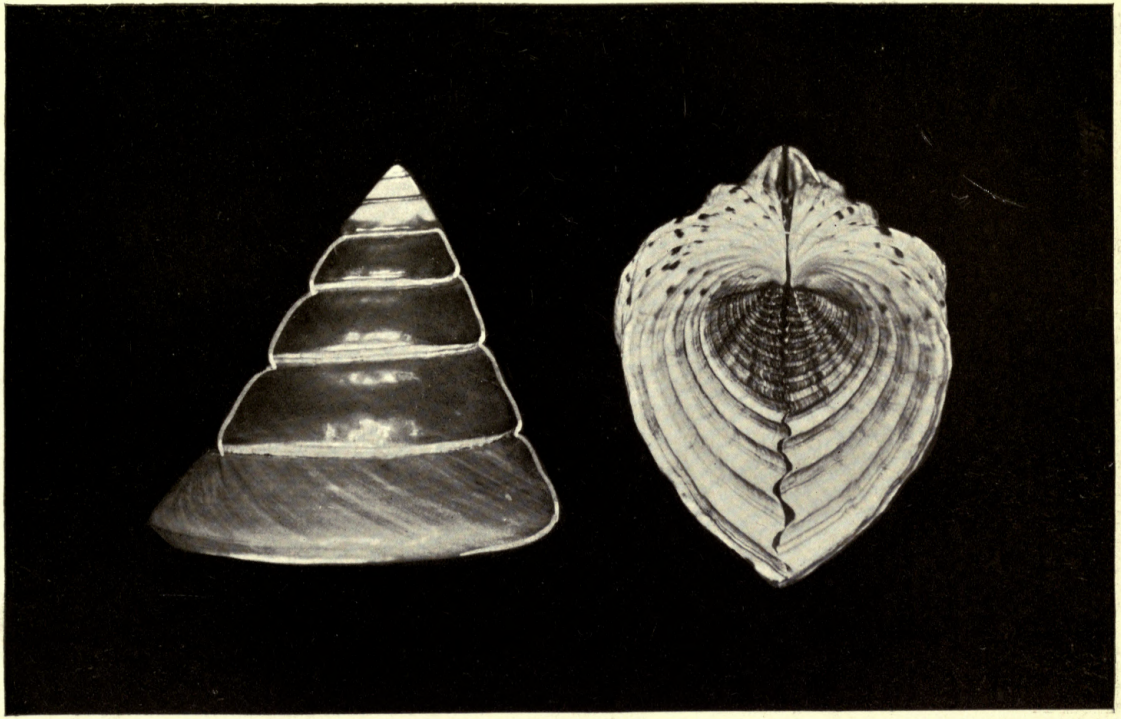


Fig. 62.—Pearly Trochus.

Fig. 63.—Clams.

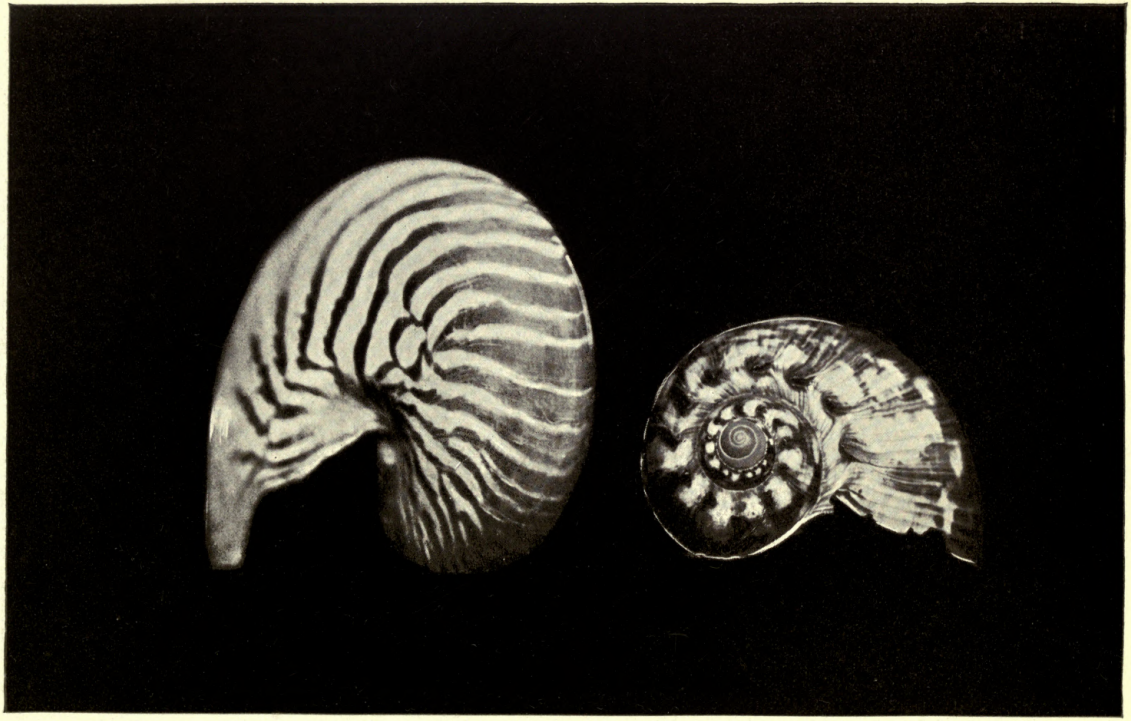


Fig. 64.—Common Nautilus.

Fig. 65.—Coronated Melon.

trochus have been obtained, however, from enormous depths; there are more than 150 known species, and the shell is found from the Arctic to the Antarctic circle. Most of these Pearly Trochus shells come from the islands of the Indian Ocean, but nearly twenty different species occur round our own coasts, some of which are elegant in form and structure.

Fig. 63 represents the Clams, which is a sort of oyster, and among these the largest of all the bivalves are found. Mr. Saville Kent found one in Australian seas which measured no less than four feet in diameter, and weighed several hundredweights! Our illustration will convey some idea of the elegance of this shell, the dark portion being brownish-orange in colour, the remainder of the shell whitish-yellow, marked with reddish-brown. They are largely used as ornaments, and are employed in Roman Catholic churches as holy water stoups or *bénitiers*. The Soft clam is really the only British species, being found generally between high and low water marks, among gravel, mud, sand, and other soft parts of the shore. The Giant clam, which inhabits the East Indian Ocean, sometimes weighs more than 20 lb. (the creature itself, excluding the shell), and is an edible species.

The Common Nautilus (Fig. 64) is a kind of snail, and its shell has a number of chambers, in the outermost of which the creature lives. The inside is pearly

in colour, and when the shaly covering of the outer walls is taken off, the surface is like porcelain. The nautilus is a deep-water inhabitant, chiefly living in tropical seas. It is caught by the inhabitants of various islands in the tropics for the purpose of food, the flesh being said to be very good eating. The chambers of the shell are separated from each other by little walls composed of the same substance as the shell, every one of the chambers formed by these walls (called septa) having been in turn the residence of the animal, and been abandoned as the creature grew too large for it.

Our photographer has given us in Fig. 65 a view of the whorls or scrolls on the crown of the Coronated Melon, the beautiful pattern of which is admirably depicted in our illustration, the spines which start from them surrounding the head like a kind of crown, and resulting in the shell being often called the 'Diadem Shell.' It is a large, showy shell, many of the species being of great beauty and rarity, often ornamented with a variety of colours. The species illustrated is rusty brown in colour, mottled with white and greyish-white, whilst inside the colour is yellowish. The owner of this shell is somewhat like a large snail, and possesses a large and thick foot. It does not lay eggs, but produces its young alive, these being about an inch in length at birth. Most of these shells come from New Guinea

and the Papuan Islands; the Papuan islanders use the shells to bale out their canoes.

The Black Helmet (Fig. 66) belongs to the Whelk family, no less than thirty-seven species being known to-day as living creatures, and thirty-six have been found as fossils. All the Cassis family tenant tropical seas. The shells are thick and heavy, as our photograph suggests, and have a short spire. The beautiful dark colour of the lips accounts for the name of Black Helmet, but, curious to relate, when cut into a cameo, the design appears white upon a dark claret-coloured ground. The lips are short, extraordinarily toothed and ribbed. The outer lip is thick and very much wrinkled, and bears ten curious 'teeth,' the middle one bearing a striking resemblance to a tooth. The outside of the shell is whitish, and the species figured is found in large numbers on the shores of Madagascar. The chief supply, however, comes from the Bahamas. It is employed in the manufacture of shell cameos, and is often called the cameo shell; the smaller shell known as *Cassis rufa* is better for this purpose, however, and is brought from East Africa.

Our next illustration (Fig. 67) is of the Pink Conch, and the species shown is a typical representative of the Stromb family. It is often used for decorative purposes and in the manufacture of cameos. This shell is the largest univalve known, weighing sometimes as

much as four or five pounds. The outer lip, as will be seen from our photograph, is very much expanded, and this accounts for the name of 'wing shell' sometimes given to it. The inside of the shell is beautifully smooth, and pinkish in colour; but the outside is, towards the spiral, rough and coral-like. It has upon its back two prominent horns, and one or two smaller ones, and the whorls have many spines upon them. The creature tenanting this shell is a sort of whelk, and moves by a series of short jumps. It has large eyes, which are placed at the end of two long horns or stalks, after the manner of the snail. These eyes are very perfect, few marine creatures having eyes so complete.

We may now proceed to consider the biographies of some British species of the Mollusca, and this at once introduces to our notice the well-known Common Whelk, an illustration of which, and a cluster of its egg capsules, appears in Figs. 68 and 69. A coloured illustration of this shell-fish is also given in the frontispiece to this chapter, Fig. 4.

The rambler along the seashore cannot fail to notice the shells of the whelk, some tenanted, others tenantless. Be careful, however, in assuming that the whelk has disappeared from the apparently empty home, for, perchance, when you pick up the shell, a Hermit crab will poke his head out of the front door and give you

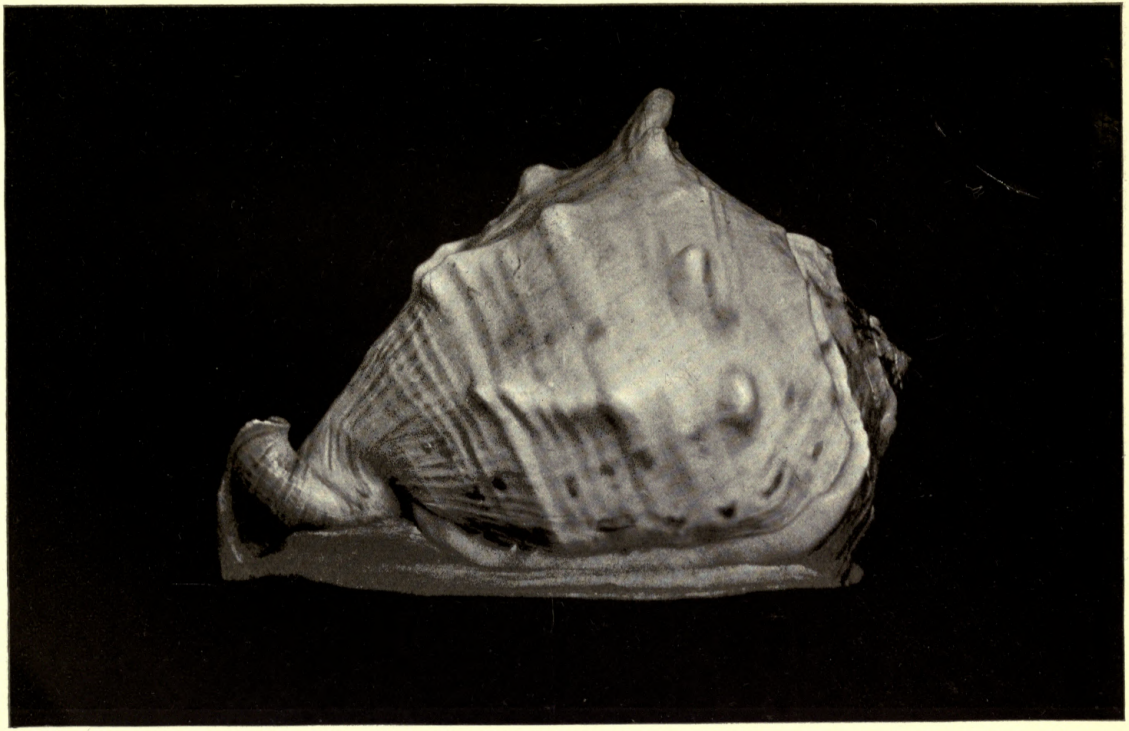


Fig. 66.—Black Helmet.

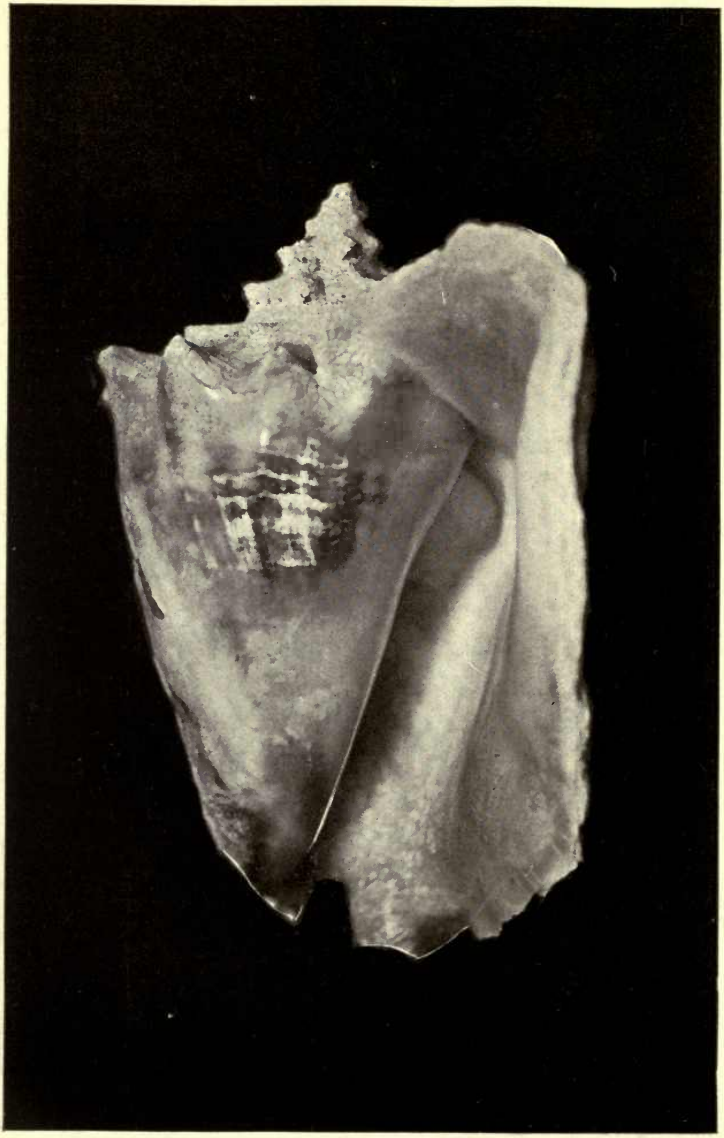


Fig. 67.—Pink Conch.

a nasty nip before you have time to realize what is happening!

These whelks are very common sea creatures They are much sought after for human consumption, and also make excellent bait for fishing. If you possess an observant eye you may also come across the very curious egg clusters of the whelk, a small selection of which is shown in Fig. 69. These eggs are yellowish-white in colour, and are very light in weight. A puff of wind will blow them along the shore. Each cluster of eggs is about the size of a small teacup, and doubtless the reader—if he has seen some—has wondered how it is possible for such a small animal as the whelk to produce such a large ball of eggs. When the eggs are first laid they are very small, no larger than the head of a pin. When the egg-cluster has been deposited in the water a change soon takes place, inasmuch as the skins (not shells) of which the capsules consist are elastic-like. The skins soak up water which cannot pass out again, but it is gradually absorbed until the egg becomes as large as a pea! If the skins be removed from a cluster of whelk's eggs in early spring, each egg will be found to contain the minute shell of a whelk, the young one just upon the point of emergence from its skin-covered retreat. In opening some of the capsules one may find well-developed baby whelks, their transparent bodies containing as many

as seventy to eighty undeveloped eggs. Owing to this habit of feeding upon its relatives, the young whelk remains in the egg-case until its shell is well formed.

Whelks are destructive shell-fish, and an examination of some of the pretty little donax shells found around our coast will show at once one of the marine creatures upon whom the former carries out its ravages. Many shells will be found to be prominently punctured. A whelk has drilled a hole, by means of a wonderful boring instrument he possesses, clean through the shell of the donax, thus killing it in its own home. Upon poor little donax—a remarkably pretty shell, marked with red and white stripes—the whelk will then thrust his attention, and in the course of a few days will succeed in destroying a large number of these bivalves. Although the donax has the power of tightly closing its two shells together, this is no barrier to the crafty whelk.

The donax congregate in large numbers, and the reader when walking along the shore has probably crushed many under foot. The empty shells crack and produce quite a loud report at times. If, however, one is fortunate enough to observe a donax at home, he will be amused at its antics. The little creature only possesses one foot, and with this snow-white limb it proceeds to propel its body and shelly home across the sand and over the empty shells of its relatives.

The donax can neither go forwards nor backwards; it moves slowly sideways.

The Common Periwinkle is known by sight and taste to almost every one, but in its natural condition is not nearly so familiar. I have often been interested in watching them in the little pools of water left by the tide, and marvelled at the rapidity with which they can propel themselves along the floor of the sea. One would hardly believe that a shell-fish could scuttle along with such alertness and swiftness. This species is represented in our illustrations in Plate VI., Fig. 2, and in Fig. 70 (A). It possesses quite a nice-sounding Latin name, *Littorina littorea.* It is worthy of note that we have a periwinkle shell-fish and a periwinkle wild plant. The shell is generally black, sometimes brown or red. In the adult winkle the shell is smooth (as those who are fond of these fish know), but in the young the surface is ridged. There are a large number of species and varieties of periwinkles, and quite a variety may be collected if the seashore naturalist commences operations at high-tide mark and works down to low-tide mark. On placing the specimens together a great difference will be manifest even in one and the same species. The edible kind can be picked out with comparative ease, but others which possess a flattened spire will need careful examination before certain identification is secured. Perhaps four distinct species

of unedible winkles may be found, and a number of varieties. If the observer is fairly successful he may count *Littorina obtusata* (English name, Spireless Periwinkle, see Fig. 71 B), *L. rudis*, *L. patula*, and *L. neritoides*. The number of species mentioned is only five, but so many of these Mollusca vary in colour according to their environment, that quite a large collection may be made of varieties, and it is interesting to dissect the various forms. I commend this pleasant and harmless pursuit to the young naturalist when next he visits the seashore, and can promise him a rich fund of enjoyment.

The Common periwinkle which is used as food is found in immense numbers on some parts of our coast, and to visit a winkle-bed is an interesting experience, unless you trespass, as I did, unconsciously, on the rich preserves of the Whitstable Fishery Board! Thousands upon thousands are found congregated together, and no matter how many are collected within a short time, there appear to be as many as, if not more than, when first examined. The Dog periwinkle—a larger and stouter animal than the edible kind—is not good to eat. The reason is the number of eggs inside which contain the shells of the young winkles. These make it far from palatable. Howbeit, various birds dearly love them, and take considerable toll from their numbers, as also from the commoner kind. Our friend the speckled-breasted

thrush not only has his favourite snail-stone, where he dexterously smashes snails and gobbles up their soft bodies, but he is also a constant visitor to the winkle-beds at low tide.

The generic name of *Littorina* implies that the members of the genus are littoral forms, existing as they do almost entirely between tide-marks, and exhibiting much partiality for fresh water and even for dryness.

An illustration of three Limpets firmly riveted to a rock is shown in Fig. 61, and further examples are given in Figs. 72 (C), 73 (D). It is remarkable to notice how securely these shell-fish attach themselves. This is still more extraordinary when one remembers that the circular foot which the limpet possesses does not bear any hooks or claspers. Its foot, as a matter of fact, acts as a sort of sucking-disc, and is of such power that great force is necessary to detach the creature from its resting-place. Often and often I have tried in vain to dislodge limpets—some small, others large—from rocks and other places, and only those who have put the matter to the test have any idea of the exertion necessary if success is to be obtained. Mr. F. Martin Duncan, in his excellent book, *Denizens of the Deep*, writes: 'The tongue, or radula, of the limpet is a very wonderful, horny structure, armed with about a hundred and sixty rows of teeth,

by means of which the limpet rasps the seaweeds, corallines, and other objects upon which it feeds. The limpet must have been an important article of food to prehistoric man when a dweller by the sea, for its shells are always found to be very abundant in the old refuse heaps called "kitchen middens," whenever they are opened.'

One must not suppose that limpets always adhere to rocks. Their empty shells may be found in plenty upon the shore, but, more interesting still, the animals may be observed crawling about like our friend the snail. This is accomplished by means of the so-called foot. An examination of Fig. 73 (D) will give the reader more idea than a written description of the underside view of this animal, A being the gills, B the mantle, and C the 'foot.' The mouth and tentacles are also well shown in this illustration.

There are several different kinds of limpets, but the mention of two species more must suffice. One is the Key-hole limpet, and the other the Cup-and-saucer limpet. The former is so called because at the top of the peak there is a hole which bears somewhat of a resemblance to a key-hole. Through this the animal squirts out water. For what purpose? the reader may ask. The answer is that water is squirted out that has passed over its gills, the latter being a proceeding very essential to all animals possessing gills.

If, as the Rev. Theodore Wood says in one of his entertaining essays, one could see the Key-hole limpet under water performing its squirting operations, a kind of little fountain would be seen spouting out from the top of its shell all the time the animal is breathing. The Cup-and-saucer limpet will perhaps be considered ill-named if an examination is made of the upper surface of the shell, but an inspection of the underside will reveal at once why this curious name has been given. In the upper part of the underside there is to be seen a sort of curved plate which strongly resembles a small tea-cup, the shell encircling it serving as the saucer! Further, if the wonderful little inhabitant of the shell be closely examined, it will be found that on the extremity of the long tooth-ribbon there is an organ which is similar to a tea-spoon! Thus, as Mr. Wood says, 'we have cup, saucer, and spoon all in one!'

We now come to the Large Top, shown in Fig. 74 (E). The beautiful Pearly Trochus illustrated in Fig. 62 belongs to the same genus as our own British species, but the latter is not nearly so large nor so alluring in its coloration as the first-mentioned species. Nevertheless, both the Large Top (*Trochus zizyphinus*) and the smaller and commoner kind known as *Trochus cinerarius* are most interesting and indeed beautiful shell-fish. The former inhabits deep water on the East

Coast, whilst on the West it is to be found between tide-marks. Beyond this the empty shell may be found on many parts of our coast-line. As our illustration shows, it is conical-shaped. There are eight or ten whorls; the shell reaches an inch or more in height, and is generally spotted with rose colour. Our artist has depicted the animal with head protruded and showing the tentacles. The smaller *Trochus cinerarius* is dull ash-colour, with oblique, dark-tinted lines. When the outer covering is rubbed off the beautiful mother-of-pearl lining is seen. On the rocks it may be found in large numbers in a living condition, and is known to the children as 'Silver Tommy.' It is a vegetarian in diet.

Of the Cowry an example in colours is given in Plate VI., Fig. 5. This is a favourite shell with the children, who collect large numbers of them during their long-looked-for sojourn at the seaside. It is a common species on sandy tracts of shore, but if the living animal is to be encountered, search should be made among the rocks at low tide. It is very different from the shell when tenantless, for the cowry expands two bright orange folds and envelops the shell so completely that you cannot on occasions see the latter at all! The head, foot, and siphon are pale yellow—indeed, a perfect specimen of this mollusc is a really beautiful little animal. We are writing of the body, not the shell,

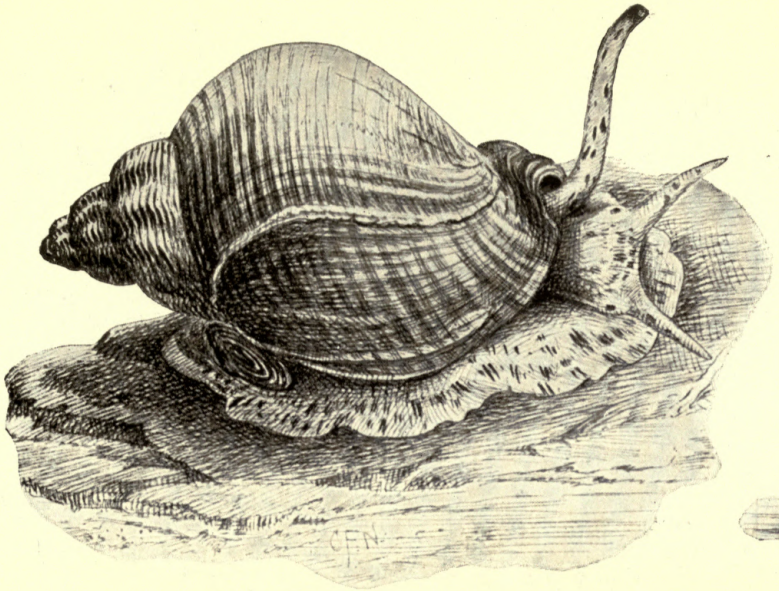


Fig. 68.—Common Whelk.

Fig. 69.—Small Cluster of Egg Capsules of Whelk.

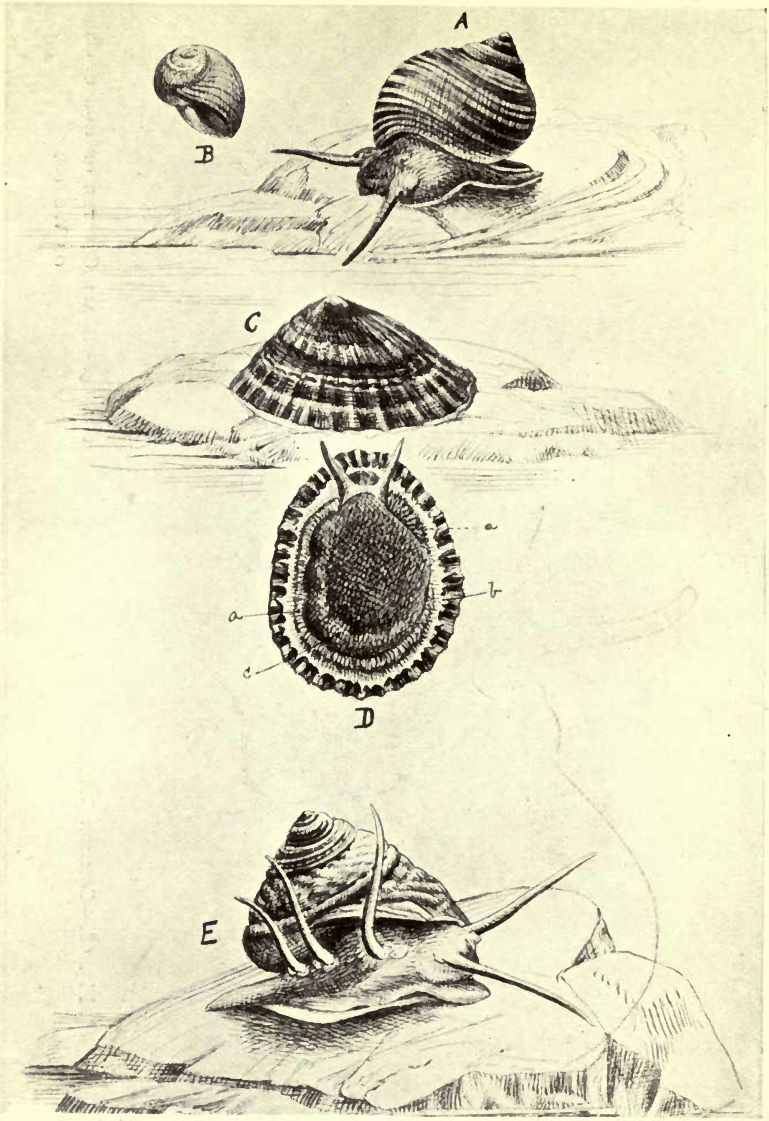



Fig. 70.—(A) Common Periwinkle.
„ 71.—(B) Spireless Periwinkle.
„ 72.—(C) Common Limpet (Upper surface).
„ 73.—(D) Common Limpet (Under side). *a*. Gills. *b*. Mantle. *c*. Foot.
„ 74.—(E) Large Top.

which is white. This little inhabitant of the seashore is of course a relative of the large kinds of cowry shells that are found in foreign countries, where they are used instead of money. These are often very handsomely marked, and serve as ornaments for our mantelpieces, and for embellishing fancy boxes and other articles.

We have already described how the Oyster forms its shell, how the young oyster grows, and how a pearl is produced. We may now add some further information about this well-known shell-fish before giving place to the next species upon our list.

A coloured example of the oyster appears in the frontispiece to this chapter, Fig. 3, but the outside of the shell is a poor subject for the artist's brush, and it is so well known that a detailed description can be dispensed with. The Edible oyster is closely related to the Scallops shortly to be described, and belongs to the Bivalves—namely, an animal possessing two shells, a Univalve being an animal having one shell only. This is a sedentary species when in the adult state; it is then, as a matter of fact, incapable of movement. It possesses no alluring attractiveness in its shell, and, were it not for its culinary value, little, perchance, would be heard of it. As it is, the oyster-fisheries of Whitstable and elsewhere result in a large amount of employment being found for fisher-folk and our market people, and this shell-fish is considered a great delicacy.

This is a mud-loving bivalve, and there is just reason for this—namely, if the oyster resorted to sandy localities the grit would find its way between the shells, and the creature would have difficulty in closing its home. Besides this, the animal would be suffocated. The large number of eggs laid by these shell-fish is almost incredible, the female depositing as many as eight or nine hundred thousand in the early summer! I said the mother oyster deposits the eggs, but that hardly meets the case. The eggs are produced, and then she carries them in her gills for a few weeks. They are then known as 'oyster-spat.' Eventually they are duly deposited in the water, and this is carried out by the shells of the mother being opened, and the eggs are squirted into the water. They are most minute even after having been produced several weeks, but the youngsters are soon able to swim. Later on they sink to the floor of the ocean, or the mouths of rivers—which they also frequent—and attach themselves by the surface of the lower valve to any obliging object. Once secured there, like the Acorn barnacle already described, they remain for life, unless the oyster fisherman detaches them from their close retreat. The gills possessed by fish are breathing-organs, as is perhaps too well known to need mentioning. It is important to recognize this in the case of the oyster, however, because by means of its gills the creature not only

breathes, but also catches its food. This is accomplished by the tufted gills sorting out, as it were, those portions of decaying matter upon which the oyster feeds. Yes, it is true that the oyster feeds upon various decaying matter, but in spite of this its popularity for culinary purposes remains undiminished!

Mr. Berridge has given a characteristic study of the Mussel in Plate VI., Fig. 6. Whilst there are a number of species in different genera, our present purpose is to describe the edible kind known by the Latin name of *Mytilus edulis*. Closely related to this species, but claiming kinship with other genera, are the Horse mussel and the Marbled Crenella. Sometimes, however, all three species are placed in the same genus. The Edible mussel is a common inhabitant of the seashore, and may easily be observed in a living condition. Although on some parts of our coast-line it is only found in comparatively small numbers, where mussel-beds are protected and preserved dense colonies prevail. These have a large commercial value. These shell-fish demand an abundant food supply, and Miss Newbiggin states that 'they seem to depend largely on the fine refuse brought down by rivers, and they rarely flourish except where food of this kind is abundant. Where it is abundant, however, they occur in countless numbers, as every one who has seen a healthy mussel-bed must know. In

one respect such beds are peculiarly deceptive, as the unwary naturalist is likely speedily to discover. My own first introduction took place in the Firth of Forth, where a very low tide had laid bare a long stretch of thickly covered rocks, dotted here and there with huge starfish. Mindful of the tide, I hastened outwards with more speed than discretion, and, planting a hasty foot on a patch of mussels, found that it sank downwards over the boot-top in a mass of fine mud before it reached the firm rock. Later, I learnt that this mud may reach a depth of many feet, so that it is distinctly unwise rashly to undertake the investigation of mussel-beds. What happens is this : the mussels attach themselves to a smooth rock, and by means of the fine cilia (whip-like threads) on the surface of the gills and mantle produce rapid inhalent currents. If the water contains many suitable solid particles they flourish apace, digesting these, and passing out the indigestible residue in the form of fine mud. This mud accumulates rapidly, and would soon stifle the mussels, were it not that as it is deposited they gradually lengthen their attaching threads, so that they rise above the surface of the rock. In still water the process may go on until the byssus threads reach a length of several feet, the space between the shell-fish and the rock being occupied by a mass of solid mud. The result is that although a flourishing mussel-bed may be both

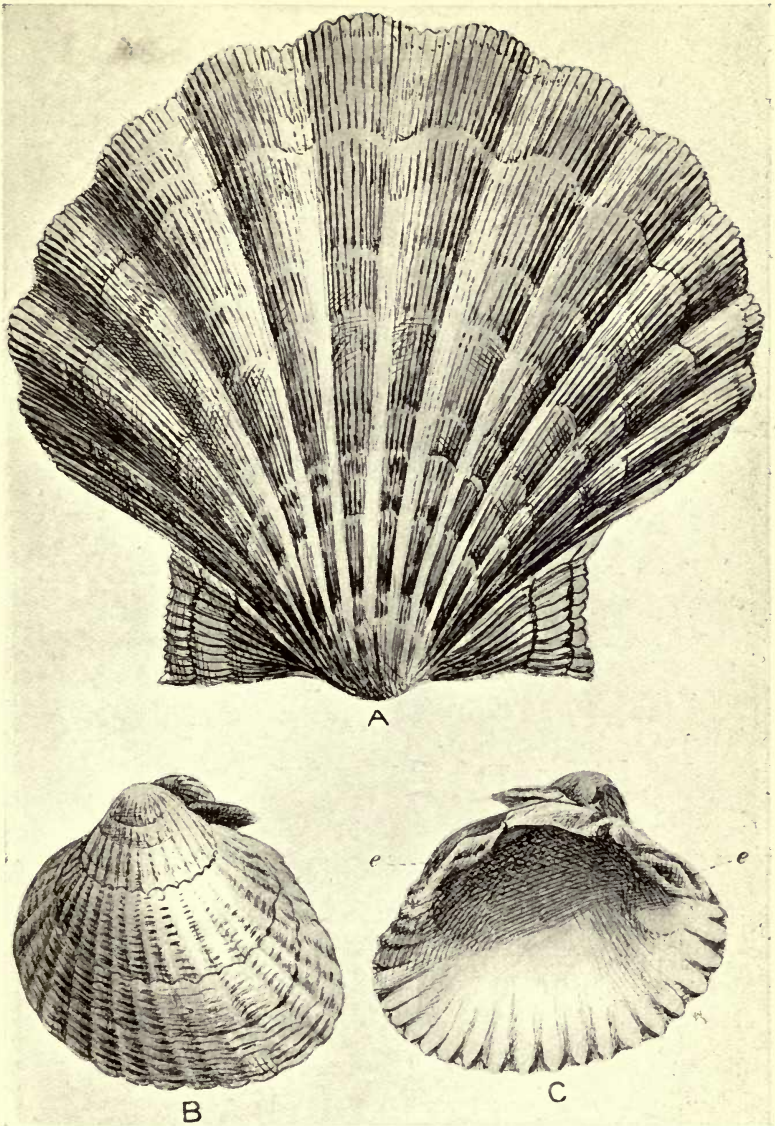



Fig. 75.—(A) Great Scallop.
„ 76.—(B) Common Cockle.
„ 77.—(C) Common Cockle under Valve showing Lateral Teeth.

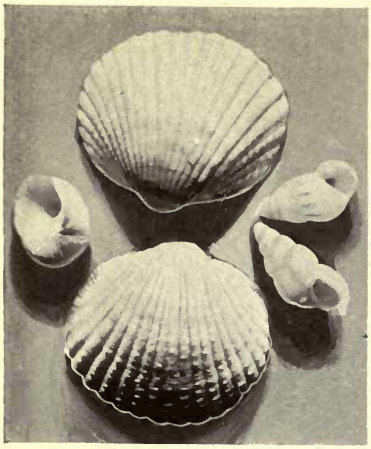


Fig. 78.—Shells from Deal Sands.

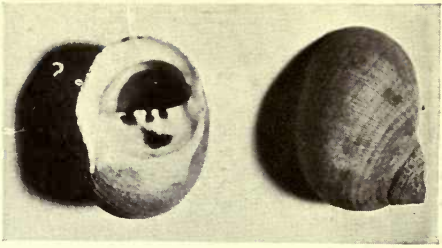


Fig. 79.—Bleeding Teeth Shells.

Fig. 80.—Five Shell-fish among Seaweed.
Note the strong resemblance to the bladders on the seaweed.

Fig. 81.—A Portion of a Pebbly Beach.

useful and valuable, it is neither pretty nor sweet-scented.'

I may say that I, too, have visited the Firth of Forth, and noticed with interest the mussels in the mud. I can endorse Miss Newbiggin's comments as to the treacherous character of the Firth of Forth mussel-beds when explored under the conditions she so graphically describes, and I remember, too, that my olfactory organ was put to a very severe test! Personally, I could not understand the presence of the mussels among the mud. I wondered how they attached themselves to it. Imagine my delight, therefore, when a friend in the North directed my attention to Miss Newbiggin's description. Mussels, however, may be found in many other places, and appear in large quantities upon piers, jetties, rocks, and elsewhere, great clusters of them being observed underneath piers when the tide is out. They attach themselves there by their strong threads, called the 'byssus,' as described above, and once secured it is a difficult matter for them to be dislodged. They do not, however, remain riveted for life like the Acorn barnacle and the oyster, as they possess locomotive powers, and can crawl about at will. The dark coloration of the outside and the pearly character of the inside of the shell are both well known.

The Great scallop (see Fig. 75 A) is a very fine

bivalve, and although not so plentiful as the Common scallop (*Pecten opercularis*), and difficult to procure, the shells may be found by the diligent seashore hunter, or the tenanted valves may be seen in fishmongers' shops, for both the species mentioned are good to eat. The Great scallop is no distant relative of the Clam, treated of earlier in this chapter, and illustrated in Fig. 63; indeed, the first-named is often called a Clam. As our illustration of the scallop shows, this is a large species, attaining a size of six by five inches. The pale colour is often mottled very prettily with pink. The upper valve is invariably darker in colour than the lower one, and the latter is also much smaller and deeply convex. The upper valve, as will be seen, is almost flat. The only exception is the beak, where, it will be observed, a slight concavity is present. The fine large shells of this animal are often used by country people for the purpose of serving as a garden edging, or ornamentation, and when nicely arranged, with the outside of the shell towards the path, the effect is very pleasing.

Sometimes the inhabited home of the Common scallop may be found upon the beach, the creature having been washed ashore during a storm. Scallops, however, are generally obtained by dredging, and it is unlikely that the young naturalist—for whom this story is primarily written—will be fortunate enough to become on intimate terms of acquaintance with the living animal.

Its shells, however, are to be found on almost any stretch of sandy shore; but where there are scallop beds, *small* living specimens may be located on the adjacent rocks.

This marine creature possesses remarkable eyes. When the living scallop opens its shell in the water, its organs of vision cannot fail to arrest the attention of the onlooker. As they change tint—shining resplendent like some costly jewels—one is held almost spellbound. These organs are situate round the two fringed mantle-folds, and although it is not certain that the jewel-bedecked eyes are very powerful, it has been ascertained that the scallop does in a measure 'take its bearings' by their means. This shell-fish propels itself through the water in a very remarkable way, and its actions in this respect are very entertaining. If the valves be open, the scallop, when it desires to shift its position, rapidly brings them together, and this is accomplished with such rapidity that the animal is jerked through the water as a consequence. This is a salient feature of the habits of these mollusca, and it is a curious sight to observe an inactive and apparently motionless creature upon the bed of the water suddenly come to life, as it were, before one's very eyes, and literally drive itself through the liquid element.

The Common Cockle, both upper and under side, is well shown in Figs. 76 (B) and 77 (C); the latter exhibits the lateral teeth (E) situated upon the lower

surface of the under valve. There are a large number of species, but the one illustrated (*Cardium edule*) will serve our present purpose. This is the common kind used for food, and the animal is characterized by the possession of a large elongated foot. By means of this the cockle is enabled to take leaps in the water and to burrow in the sand. Its habitats are sandy and muddy localities, and it is to be found on, or just underneath, the surface. The shell is very convex, as our illustrations depict; and if an empty home be examined, the scars left by the muscle and the strong central tooth in each valve, and the small laterals on each side, may be easily discerned.

To distinguish between the different kinds of cockles it is essential that attention be paid to the sculpture of the shells and the number and the form of the ribs. So plentiful are cockle-shells on some parts of our coast that they are harvested, and, after being crushed, are used for making paths in the place of gravel. To find the living animal it will be necessary to search at the edge of the waves when the tide is well out. Even then you may not see one, but if you watch carefully you will observe a tiny jet of water spouting up from the sand or mud. This is the action of a cockle below, which throws up the water thus after the air has been drawn from it by suction. As is shown in several of the animals whose biographies are considered in this

and our last chapter, it is essential that a fresh flow of water should be obtained to prevent suffocation. The cockle draws the water down by means of one of the siphon tubes with which it is supplied, and it is ejected through another. If you desire to catch one of these interesting folk and examine its spouting habit closely, you will have to dig very quickly, as the cockle, like the mole, is a remarkable burrower, and by means of a very powerful organ called the 'foot' it can dig down to a depth that will probably place it out of harm's way. Should you be fortunate enough to observe a cockle aboveground you will be surprised at his activity, for by means of his foot he can perform wonderful jumping feats for an animal which we might on first sight consider of an inactive and sedentary character.

In Figs. 78, 82, and 83 are shown some microscopic shells taken from the sands at Deal. Without the microscope it would be quite impossible to see these minute shell-fish; indeed, to the naked eye the shells appear as part and parcel of the sandy shore. Obtain a few specks of sand, as it were, and examine them through a strong magnifying-glass—or, better still, a good microscope—and you will be amazed at what is revealed. Is it not wonderful that mere atoms should, when highly magnified to the extent shown in our illustrations, reveal such remarkable form and structure? Here we see various shells, the form and pattern-

work of which are deserving of close study. The young naturalist will obtain great assistance in his studies, and find endless interest and wonder from the possession of a good glass or microscope. We owe a debt of gratitude to the microscope, and were it not for its remarkable power in showing us inhabitants of the almost invisible world in a greatly enlarged form, our knowledge of them would be very scanty. The higher the power of the microscope, the greater are its revelations, and the greater becomes our gratitude for the invention which enables us to read the epitaphs and biographies of creatures which would otherwise be unknown and unseen.

Before concluding our survey of the Shell-fish life of the sea and seashore, attention may be directed to the remarkable illustrations of the Bleeding Teeth Shells shown in Fig. 79, where the upper and under views are both given. These shells came from the West Indies, but the form of the underside is so unique that it is here introduced to the notice of the reader. In the underside view of the shell on the right of the picture it will be observed that there is a small black-looking patch just above the 'teeth.' This is red in the shell itself, and gives the name to it of 'Bleeding Teeth.' The teeth portion of the shell is exactly similar to a mouth, as will be seen by an examination of the photograph reproduced.

Fig. 82.—Microscopic Shells from Deal Sands.

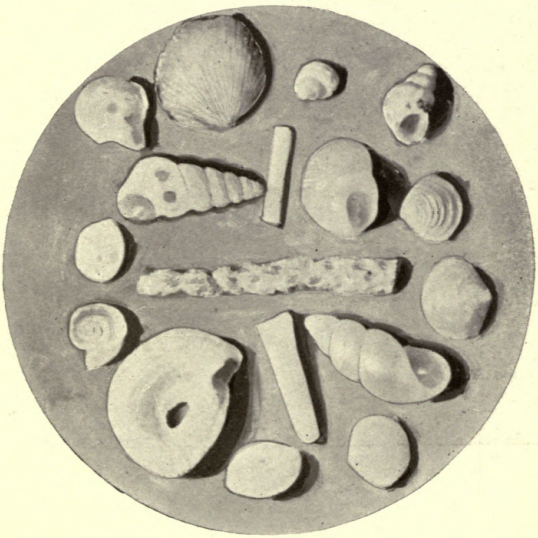


Fig. 83.—Microscopic Shells from Deal Sands.

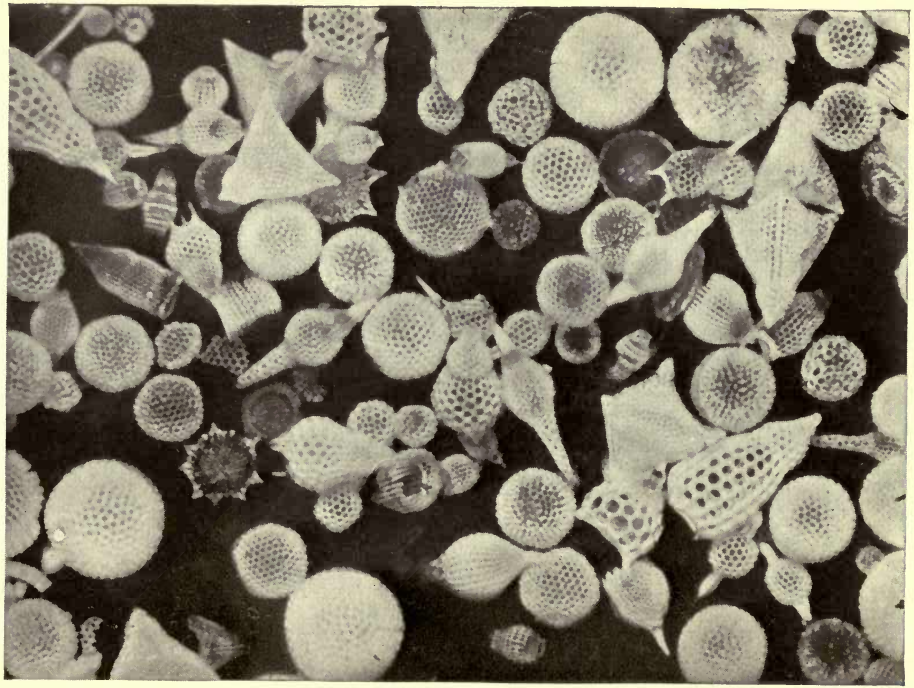


Fig. 84.—Polycystina from Barbados.

Figs. 80 and 81 are interesting pictures, because both in their way help one to comprehend how some animals are protected by the environment they occupy. In the former figure, for example, will be seen five shell-fish adhering to a piece of seaweed, and showing a strong resemblance to the 'bladders' upon the latter. The resemblance is more striking in the objects themselves than in the photograph. On a pebbly beach, such as that depicted in Fig. 81, it is often quite impossible to detect the presence of various seashore creatures, but particularly the eggs and young of birds.

An example of the eggs of the Ringed plover laid on a pebbly beach has already been given in Chapter V. (see Fig. 36), and from this further illustration of a tiny portion of such a shore the reader will obtain a good idea, not only of how difficult it is to locate the various creatures who frequent such a place, but also how rounded and smooth the pebbles become as a result of continuous washing by the sea waves.

We now come to the last, but by no means the least interesting, illustration given in this portion of our story (Fig. 84). It is a wonderful group of Polycystina from the Island of Barbados. Polycystina consist of countless millions of the fossilized homes of minute shell-fish who lived ages ago—so long, in fact, that one well-known authority has asserted that if we state ten thousand years, or ten hundred thousand years, we are

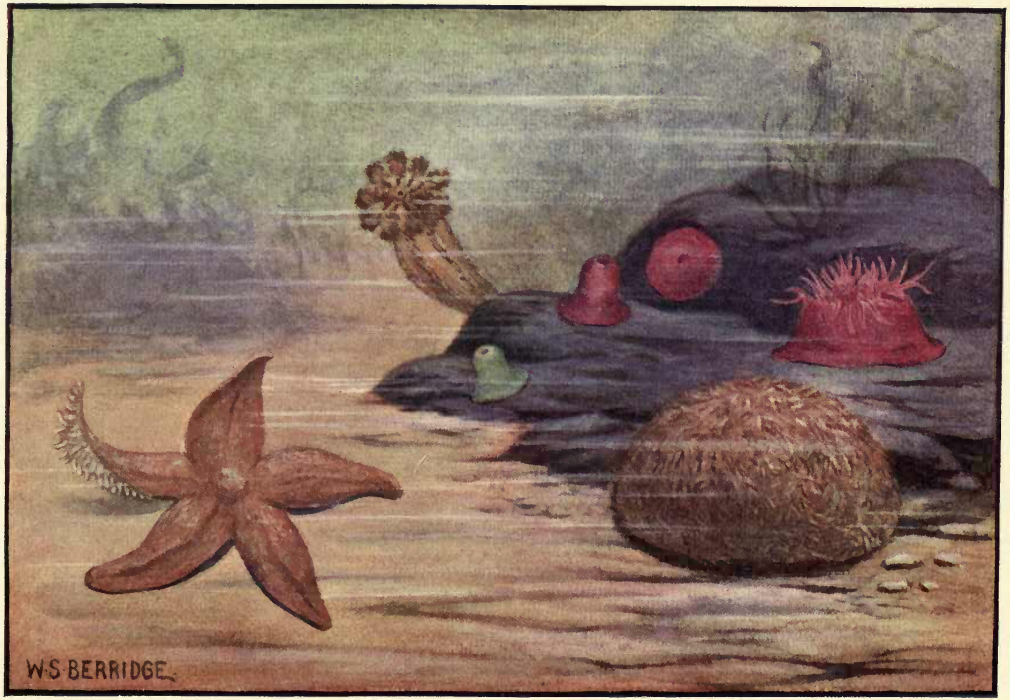
equally as likely to be near the correct period! The word Polycystina is derived from the Greek *polus*, many, and *kustis*, a cyst, or box. In this illustration we have a further example of the wonders revealed to us through the agency of the microscope. This will be better understood when it is stated that 'a piece of rock which we could carry under one arm would contain more specimens than there are people on this earth.'

It is interesting to study the fossil forms of these shell-fish, and then consider the living forms still inhabiting the ocean. These are called Radiolaria, from the Latin, *radiolus*, a little ray. The composition of the rocks of Barbados is made up of these fossilized shells of minute shell-fish, and the forms shown in our photograph represent in the actual space occupied by the specimens a mere speck about the size of the head of a pin! Yet, after all, the picture can only convey a poor impression of the real objects as looked at through a microscope. Through all the ages, these minute fossils retain the various forms, structure, and pattern work so admirably portrayed in Fig. 84. We often admire a fine piece of carving, but how grotesque that representation of the beautiful is when placed by the side of the incomparable Polycystina! Here are displayed cups, bowls, helmets, mitres, and other objects in endless succession. These wonderful epitaphs of Nature, then, consist of the flinty, forsaken homes of microscopic shell-fish which existed

in the bygone, and which, when enlarged to the proportions shown, exhibit such unmarketable beauty. Who would have thought for one moment that the rocks of Barbados were composed of these strange fossils? People sometimes talk about the fairy tales of Science. There are no such things, as Sir Edward Ray Lankester has pointed out. Here we have, in these Polycystina, for instance, an example of Nature's own, real, unadulterated fairyland *taken direct from her own illimitable storehouse.* The camera and the microscope do not deceive. They not only illustrate, but reveal Nature in all her richness and grandeur; and to those who will take the trouble to penetrate into her hidden meanings, to interpret her winning ways, a vast field is opened up. Yet, as Mr. Richard Kerr observes, 'The skill and the wisdom here involved must be far beyond man's power to comprehend. Besides, these minute objects, throughout their whole existence, are highly useful, and play a most important part in the great plan of the creation. When exhibited under the microscope, with proper illumination, they constantly excite wonder and admiration. These fossil shells that are so beautiful, notwithstanding that they have been for ages pressed together and consolidated into rocky strata hundreds of feet in thickness and miles in extent, must have had at one time living tenants, possessing power to take in food and to appropriate flinty matter suspended in the water of an

ocean that has many times over been evaporated! What a number of tremendous problems at once confront us! If some millions of these shells could be contained in a cubic inch of space, what about the unnumbered hosts of shells that are embedded in the Barbadian rocks alone? What a duration of time there must have been between the deposition of the first layer of shells on that ocean floor and the last stratum on the top! What ages must have elapsed in order to allow for the solidification of all this aggregation of shells into hard rock! Why is so much surpassing beauty hidden from the human eye? Why do so few people care to seek pleasure in such studies?' These are true facts; these are pointed and blunt questions. Let me then invite the reader's attention to some of these minute marvels of nature; for, as a result, he will most assuredly find a fund of rich interest and wonder awaiting him, and be able to read at least some tiny portion of Nature's absorbing story.

PLATE VII.




1. Sea Cucumber. 2. Sea Anemones (various forms of *Actinia mesembryanthemum*).
3. Common Starfish (*Asterias rubens*). 4. Sea Urchin.

## CHAPTER VIII

### SEA URCHINS, SEA CUCUMBER, STARFISHES, BRITTLE-STARS, JELLY-FISHES, SEA ANEMONES, ETC.

THE Sea Urchin, or Sea Hedgehog as it is sometimes called, well deserves the first place in this chapter. A coloured example appears in the plate opposite, and further specimens are shown in Figs. 85 and 86. In Fig. 85 the shelly test (as the home of the Sea Urchin is strictly called) is seen bearing the numerous sharp spines that radiate on all sides. Although these spines may on examination appear to be closely attached to the test, they are, as a matter of fact, movable at the will of the owner. When the test is deprived of its spines and is scraped, it appears in the form shown in Fig. 86. It is then perhaps more apparent than before what a remarkable structure the home of this sea creature is. The shelly test is made up of a large number of plates, and the edges of these fit together in a wonderful way. Beyond this, they are invariably found to be regular and of a uniform pattern. Whilst our spineless test will convey some idea of the

structure of these plates which go to make up the Sea Urchin's homestead, it is a mere nothing compared with the extraordinary pattern-work, design, and beauty revealed by the microscope in even a tiny portion of one of the plates. Certainly no human handiwork can be compared with it. The choicest article manufactured by the most skilful mechanic is as dross compared with pure gold! The reader would do well to examine portions under a microscope, and see for himself the general symmetry, marvellous form, beautiful design, and unfailing regularity. The knob-like structures in Fig. 86 show where the spines grew, and if one of these be examined it will be found to be hollow at the base. This enables the spine to fit over one of the knobs, or pimples, to which it is attached by a strong elastic-like muscle. Owing to this the Urchin is able —as already indicated—to move its spine as it thinks fit. On occasion it will use them for the purpose of locomotion, but not exclusively. The Urchin is able to take exercise by reason of its spines and small sucker-feet. These latter are protruded through minute holes in the test, or shell, in the same manner as is resorted to by the Starfish, a near relative of this animal shortly to be described. The fisherfolk at various seaside resorts do quite a respectable trade in the scraped shells of the Sea Urchin. Good large specimens command the best prices, but I saw many sold in the Scarborough

market at twopence each. They are usually purchased more as a curiosity or ornament than anything else, and few know what a remarkable object the shell is when closely and intelligently examined.

During the summer-time the seashore naturalist may be fortunate enough to locate a living Urchin in the pools among the rocks when the tide is out, but in the winter it goes down into deep water. It possesses five very large, sharp teeth with enamel-pointed tips, and a big mouth. You may have to look very carefully before observing one of these sea folk, for they are crafty, and protect themselves in a marvellous way. Possessing, as they do, hundreds of little sucker-feet, they poke these out of the shell, and attach, or pull down, small portions of surrounding objects. So cleverly is this work carried out, that often the shell is quite hidden by the hundreds of tiny objects that have been commandeered for this purpose.

The eggs are very small, and one individual produces millions. They are usually set free in the spring-time, and are so very minute that they simply appear as some sort of colouring matter (brick-red or orange-yellow) deposited in the water. It is essential that these eggs should be fertilized. How, then, is this accomplished? The female having produced the eggs just mentioned, the male sets free minute white-coloured spermatozoids. These mingle with the product of the

female in the water, and so fertilization takes place. It seems much a matter of chance, does it not? but is nevertheless one of Nature's designs for the propagation of her children. When the egg is fertilized a change may very quickly be observed, for within an hour an egg turns into a moving embryo.

A number of species of Urchins are found on and around the British coast. A little species known as *Echinus miliaris*, or small Purple-tipped Urchin, should be sought for among the rocks, under boulders, and elsewhere. It is a fine little creature, about two inches in diameter, and it always seems to me that these small Urchins are more prickly and spiny than their larger relatives. There are other kinds that need not be detailed, but the natural history of the *Echinoidea*, or Sea Urchin, would make a fascinating study for a young naturalist. On the Continent—and indeed in England too, as I can personally testify—various kinds of these creatures are eaten as food. I have never tasted them myself, but am told by those who have that they are nice eating. Owing to this habit these Urchins are often called Sea Chestnuts and Sea Eggs. The interior of the shell is scooped out with a spoon, much after the same manner as an egg is eaten.

Fossils of Sea Urchins are comparatively common in some kinds of strata, but such a splendid specimen as that in Fig. 87, embedded in a flint stone, is of rare

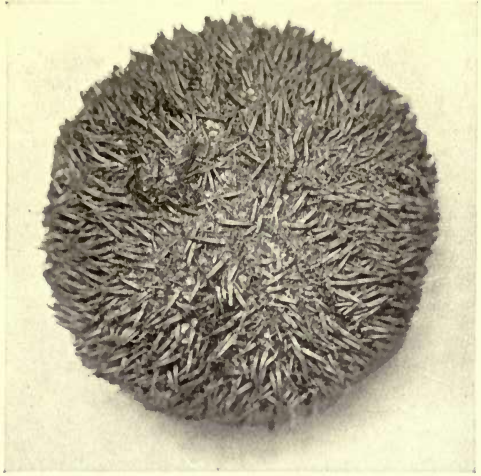


Fig. 85.—Sea Urchin, Showing Spines.

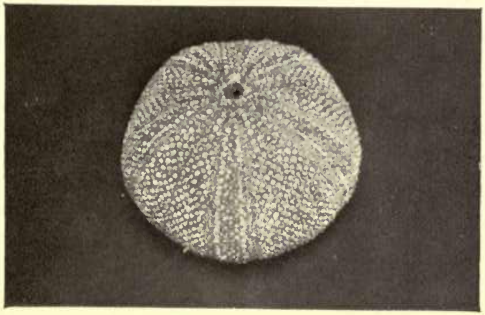


Fig. 86.—Sea Urchin, without Spines.

Fig. 87.—Fossil of Sea Urchin embedded in Flint Stone.

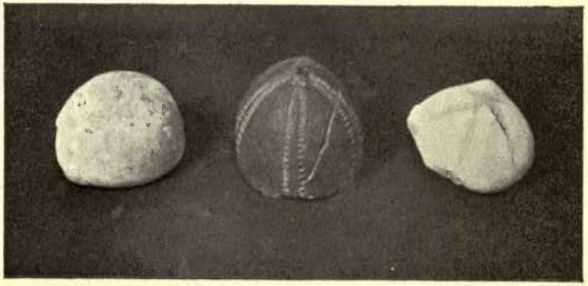


Fig. 88.—Fossils of Sea Urchin,

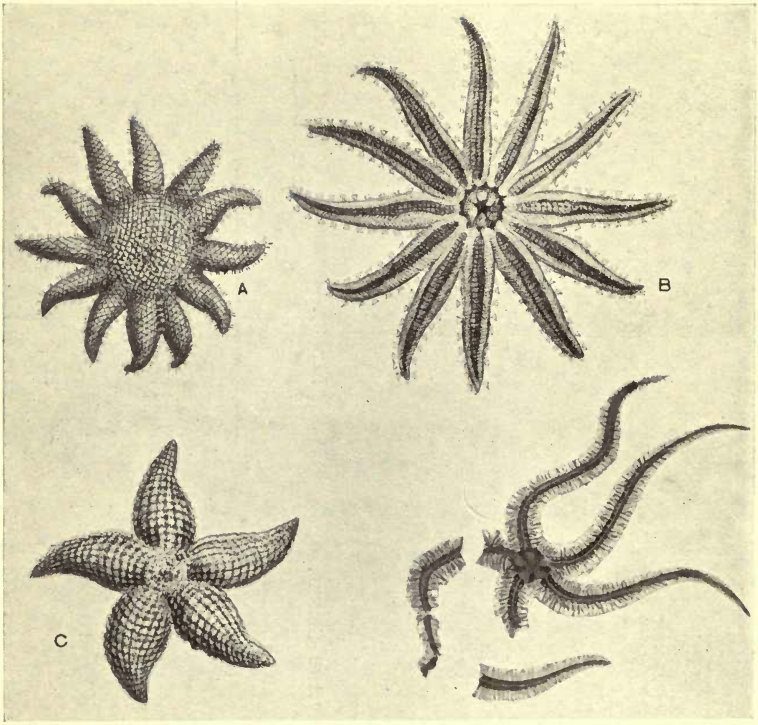



Fig. 89.—(A) Sun Starfish (*Solaster papposus*). Upper surface.
„ 90.—(B) Sun Starfish (*Solaster papposus*). Under surface enlarged.
„ 91.—(C) Common Starfish (*Asterias rubens*).
„ 92.—Brittle-star (*Ophiothria violacea*). Showing method of breaking up.

occurrence. This is a photograph of an Urchin once in my possession, and now to be seen in the Herts County Museum. The detailed markings upon the remarkable geological epitaph of this inhabitant of the sea, and its symmetrical shape, are not the least interesting features of this specimen. We have here an illustration of the way Nature has written her own epitaph for us, and an excellent example of how geologists are able to determine the ages of sea folk who at one time in the remote past had their home where now green fields, running brooks, and wild greenwood hold undisputed sway. Behind this large flint stone another fossil of the Sea Urchin had been at one time embedded, but evidently became dislodged, perhaps by the labourer who brought the specimen to my grandfather, and who was well pleased to receive the price of 'a pint' for his treasure! Three further fossils of this animal are shown in Fig. 88, the two white ones on the left and right of the picture having been obtained from the chalk.

Few people imagine that we have a Sea Cucumber as well as the better-known vegetable used for the table. It is vastly different from its vegetable namesake, as Fig. 1 in Plate VII will show. The Sea Cucumber has a greyish-white body, but with a curious feathery tuft at one end. It inhabits dark rock-pools, and it is there you must search for it. It claims relationship with the *Echinodermata*, the Sea Cucumber constituting

a group of Echinoderms known as the *Holothurians*. A typical form may be mentioned in *Cucumaria lactea*. It is about an inch in length, white or brown in colour, and possesses a tough skin. The feathery tuft at the head of the creature's body consists of a crown of ten branched tentacles. At the other end the anus is situate, and between the crown and the latter there are five zigzag rows of tube-feet. The tentacles also are modified tube-feet, and it is important to remember this because a little species of Sea Cucumber, known as *Synapta*, which occurs around our coasts, only possesses this crown of tentacles, *the tube-feet being absent*. One of the most interesting characteristics of most of these *Holothurians* is that they eject portions of their internal organs when attacked or alarmed. Beyond this, it has been stated that they suffer a good deal from eating something that does not agree with them! It will cast off its teeth, the lining of the throat, and many other parts of the inside of its body, thus reducing itself to a mere skeleton. This accomplished, the animal does not die as one might suppose, for new digestive organs form, new teeth appear, and in a short time the creature gains strength, and appears once more as if nothing whatever had happened to it!

We now come to another important and interesting group of the *Echinodermata*, the *Asteroidea*, or Star-fishes, one or more of which are known by sight to

almost every one who has visited the seashore. The first species to claim attention is the Sun Starfish. Figs. 89 (A) and 90 (B) show the upper and under surfaces respectively. These animals may briefly be characterized as possessing a radial symmetry, generally but not exclusively in five rays, with a strong leathery coating, protected with spines or plates of carbonate of lime. Their digestive system, nerve system, and reproductive system are perfect. Locomotion is carried out by means of tube-feet, which are hollow, and at the extremity of these there are little suckers which give the animal a grip of the surface travelled over. In general these latter remarks apply also to the Urchins and Sea Cucumbers, already described.

The Sun Starfish may at once be recognized by the possession of twelve or more rays, and an examination of Figs. 89 (A), 90 (B), and 91 (C) will enable the reader to follow our meaning better than a written description. Many of the Starfish vary a great deal in colour, and the Sun-Star is no exception to the rule. Generally, it is purplish-red blotched with white. At other times it is pure red, and sometimes orange. As will be seen from Fig. 89 (A), the dorsal surface is covered with curious large spines. These are separated by spaces, and it is through these that the small skin-gills come forth.

The Common Starfish (*Asterias rubens*), known to every child who has sojourned by the sea, is well shown

in Fig. 91 (c). It varies in colour like its relative last described. Common tints that may be mentioned are those of orange, purple, and red. The limy plates in the skin are nicely exhibited in our illustration, and these bear a number of small spines. The skin is netted. Another very common Starfish is known as *Henricia Sanguinolenta*. It is smaller than *A. rubens*, but is five-rayed and subject to the same diverse coloration. The skin contains more lime than in the last-mentioned species, and as a consequence is more rigid, and not so flabby. Generally this animal possesses five rays, but specimens bearing four or six rays are not uncommon. Starfishes have a large number of small legs, but these must be carefully looked for, being situate within the animal's body, and are protruded through the skin when necessity demands it. They are small, white, fleshy-looking objects, and bear at the end of each a little sucker. By means of these the creature obtains a footing, as it were, on the ground or rocks it wishes to traverse. If you are fortunate enough to catch a live animal, place it in a small pool or elsewhere. Its movements will furnish a most interesting series of observations. Then again, Starfishes—like the Brittle-stars next to be considered—have the peculiar habit of growing new rays if any of their members become lost. If a Starfish happens to be cut asunder, each half commences to grow new rays, and in a short time where

only one Starfish existed there are two! Fact is stranger than fiction even in these lowly organisms of the animal world.

Two more points may be noticed in connexion with these creatures. The eyes are situate at the extremity of the rays, and in some kinds these organs are furnished with lids, so that it is possible for the eyes to be opened and shut at will. Lastly, when egg-depositing takes place, the female has a curious way of taking care of them. Having laid them in little heaps, the mother Starfish bends down her rays over them and securely covers them. When seen thus the effect is very striking, the crafty little creature standing on its rays with the centre of her body spread out in a most curious manner. In this position she remains until the eggs are hatched. It will doubtless surprise the reader to know that these inhabitants of the sea and seashore—some live quite close to the shore, others resort to very deep water—possess bones. Two of these are exhibited in Fig. 94, a remarkably good micro-photograph taken by Mr. W. Bagshaw.

Two species of Brittle-stars are shown in Figs. 93 and 92—namely, *Ophiothrix fragilis* and *O. violacea* respectively. The first named shows the specimen intact, and the latter exhibits the method of breaking up, or the surrender of parts. With regard to this autotomy, our artist, Mr. C. F. Newall, has written an entertaining

article. This not only gives information concerning the animals whose biographies we are now to consider, but also sets out in succinct form the method of autotomy adopted by our friends the Lobster and Crab, of which we have already written in Chapter VI., besides affording interesting information on various other creatures. These comparisons are therefore most valuable, and well worthy of a place in our story.

Mr. Newall writes: 'There is an old nursery rhyme with which the reader will probably be familiar, which used years ago to exercise my budding imaginative powers. It is decidedly dogmatic, sanguinary, and obscure. It runs:

> Naughty daddy-long-legs won't say his prayers,
> Take him by the left leg and throw him downstairs.

Why the unfortunate "daddy" should be selected as a type of undevotional character I cannot say, and it may occur to the reader that to take any one by a convenient extremity and throw him downstairs is not exactly calculated to make him say his prayers, not to speak of the fierce inquisitorial spirit it inculcates. Then it is directed that he be taken by the left leg. Which? He has three left legs. Lastly, if you carefully select a likely-looking leg and try to throw him anywhere, you will probably find yourself possessed of the said leg, and the daddy sailing away complacently

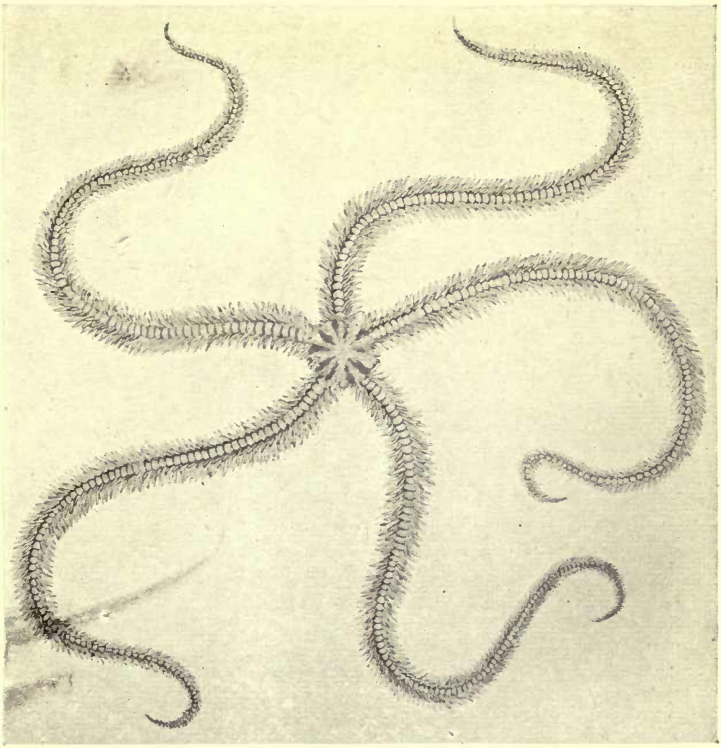


Fig. 93.—Brittle-star (*Ophiothrix fragilis*).

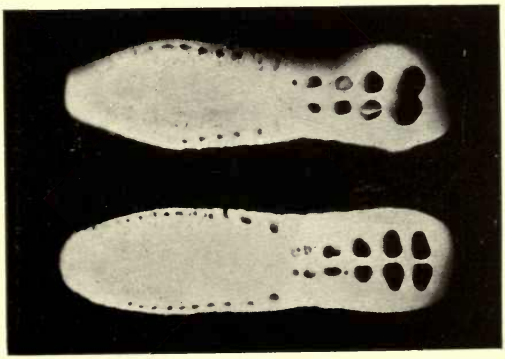


Fig. 94.—Bones of Starfish.

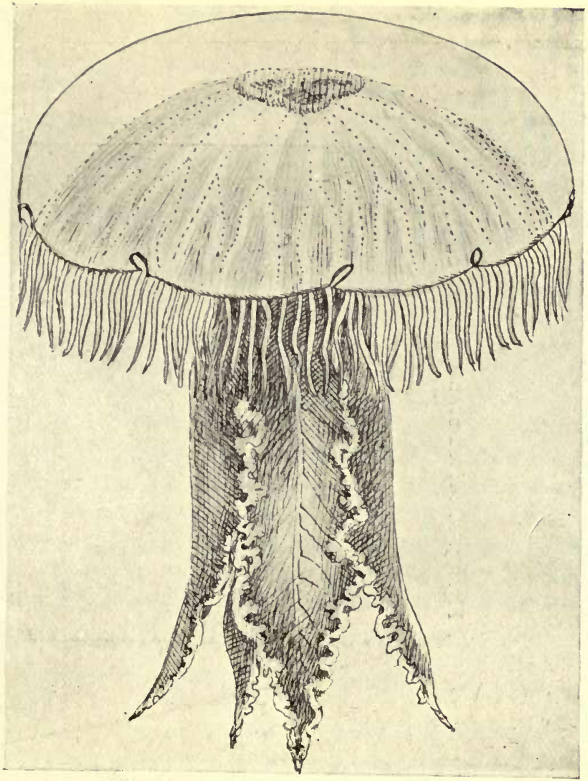


Fig. 95.—Jelly-fish (*Aurelia aurita*).

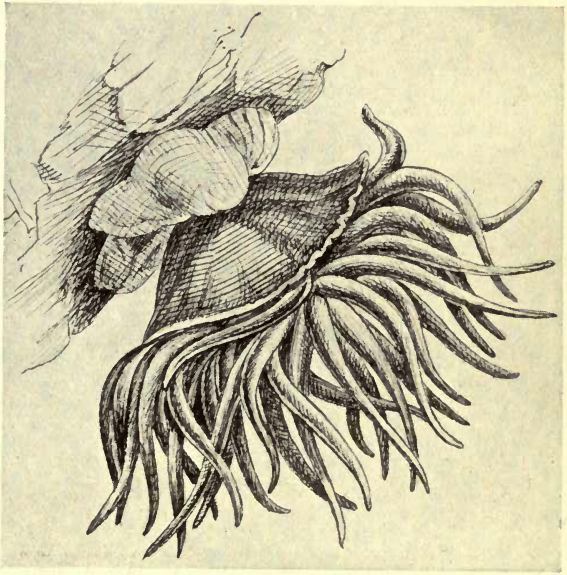


Fig. 96.—Sea Anemone Suspended (*Anemone sulcata*).

with a lofty indifference to the subtraction of one of his lengthy limbs.

'For the *Tipula* (which is the respectable name of the daddy) is one of those creatures which resort to another singular method of protection we find in operation in the animal world—that known by the name of autotomy, or the surrender of parts.

'It would seem that a good many creatures among the lower orders of animal-life—such as the crustaceans—are given to leaving behind, or promiscuously throwing about, certain parts of their anatomy in a prodigal and reckless sort of way, suggestive of waste; and Nature never countenances waste. This capacity, however, is turned to good account by many of them in securing escape when in imminent danger, or release when actually seized. These creatures have evidently come to the conclusion that it is better to enter into life halt and maimed temporarily than with full complement of parts to be done to death, and they detach a limb, tail, or other appendage by which they may be seized—a sort of ransom paid for the release of the remainder of the body.

'A sea anemone will sometimes remove to new quarters among the rocks, leaving various small pieces of the base of his column behind. In due time each piece becomes an anemone. You may cut up a hydra from our ponds into a dozen pieces, and each bit will

promptly become a hydra! When a sea cucumber has dined not wisely but too well, he usually secures relief by throwing away nearly all his internal arrangements; indeed, little but his skin is left behind. Fishermen, enraged at the depredations of starfish, often chop in two those they find, and throw them into the water to die. But they do not die. Each half becomes a lusty and efficient starfish, and instead of the fishermen having reduced the ranks of their enemies, they have increased them. The Palolo worm of Samoa and neighbouring islands is, in all probability, a deep-sea form. But at stated times the water near the surface of the sea swarms with them, or rather with their tail-ends, for not a single whole specimen, or a fore part with the head, is to be found among these portions.. The separated tail-end travels quite independently, probably to secure the dispersion of the eggs; while the head stays at home, and no doubt develops a fresh tail.

'These few instances will serve to show the extraordinary self-mutilation in which some animals indulge; but we have here to consider mainly how this strange capacity is utilized for protective purposes.

'The lizards are very partial to proceedings of this nature. You go forth to catch one of our common lizards. If you are fortunate enough to get close up to him, when discovered, you pounce upon him with

your hand, and find, perchance, you have secured a tail, but not a lizard. Yet a tame lizard may be handled by the tail quite freely without danger of this sudden fracture.

'This strange and sudden brittleness is a passing condition, caused, it is believed, by a sudden and violent nervous contraction of the muscles, resulting from a strong stimulus to the nerves by fright. In almost all cases the discarded members can be reproduced. Our little sand-lizard soon sports a new tail, and the newt goes one better, reproducing lost legs and even eyes!

'We have a small limbless reptile in this country, called the blind-worm or slow-worm, because it isn't blind, and it isn't slow, and it isn't a worm! It looks somewhat like a small snake, and at a touch almost snaps itself in two; then the tail half performs a series of lively evolutions which absorb the spectator, under cover of which the main part of the blind-worm glides out of sight to find safety and commence repairs. The severed tail continues more or less active for fully half an hour. It has been thought that, in several of these cases, the animal's main chance of escape lies in the distraction of the attention to this severed part, which ultimately dies.

'Our common marine sand-worms, or rainbow worms, as they are often called, from the play of fine

prismatic colours they show, break up in this way. Some time ago, having dug up a couple of large "creepers," I deposited them in fresh water, under the impression that it would be fatal to them, as it is to so many salt-water forms. Immediately about three inches of the tail end became detached, and was very active, continuing to move even twenty-four hours after. It is rather interesting to note that these worms, which are nearly allied to the Palolo worm, are thus given to separating their tail portions, and that in many of these nereis worms the latter half of the body becomes quite transformed for reproductive purposes, though it is *not* thrown off and independent, as in the case of the Palolo.

'An allied form, one of the Terebellidae (*Polycirrus aurantiacus*), has dispensed with the protection of a tube, and creeps about in the crevices of stones and among the roots of laminaria. It has an immense number of long, slender tentacles, and, when touched, coils itself up in the middle of them. The tentacles break off very easily, and evidently possess some unpleasant attribute. When the animal is irritated the tentacles become brilliantly phosphorescent, so that they are conspicuous by night as well as day. Mr. Garstang made experiments with the worm, and found that the body, without the tentacles, was eagerly devoured by fish. But a fish, having taken a mouthful of the easily detached and

unpleasant tentacles, is disposed to leave the creature alone henceforth.

'When two lobsters fight—and they frequently do fight—and a great claw is injured, the wounded lobster throws it off at a certain joint. There is a particular reason for this, as in the crustaceans the blood-vessels are scarcely contractable at all, and such a wound would soon cause death by loss of blood. Indeed, any sudden fright will cause the lobster to cast away his claws, and a threat is sometimes used to the fishermen by navy gunners that they will fire their big guns over the lobster beds, when a general shedding of claws would take place, which would be a serious loss to the lobster fishers.

'While the lobster parts only with the *chelae*, or great claws, the more specialized crabs detach all or any of their limbs. Miss Newbiggin (in *Life by the Seashore*) thus relates her attempt to capture one of the *Galathea* crabs:

Seeing, however, is not catching, and there is many a slip between the *Galathea* and the collecting-bottle. I well remember the first specimen I had the fortune to catch. The chase had been long, and the pool was deep, but at last the wary crustacean had been got into a corner, and heedless of her footing the would-be captor made a sudden dart. It was successful, and for one joyful instant I held the prize in my grasp. But it was just an instant; there was a sudden jerk and a splash, and I was left in the pool with one great claw in my hand, while the *Galathea* twiddled his whiskers in insolent contempt from an inaccessible crevice. I then

learnt that 'the power of autotomy is possessed by the higher Crustacea to a very marked degree,' but that information, though valuable, did not bring back the *Galathea*. Nor was I much consoled on learning further that 'the autotomy is reflex and due to the stimulation of the sensory nerve'; or, in plain English, that if I hadn't pinched the claw the *Galathea* wouldn't have thrown it off, for I defy any one to catch a *Galathea* by one leg while floundering in the water and not pinch that leg.

'But perhaps one of the most conspicuous examples of these creatures which set lightly by their anatomy is found in the Brittle-star fish (Figs. 92 and 93). Though common enough round the British coast, it is difficult to secure good specimens, for at the least interference with its actions and the first fear of capture it simply breaks up into bits. It begins to practise early in life, for the larval form, which is about as like a starfish as a musical-box, possesses at one stage certain long leg-like appendages hanging down, which at a given time are cast away in regular and methodic fashion. At the end of each radiating arm, on the adult form, there is a rudimentary eye, with a movable eyelid. This plays a part in a good account given by Professor Ed. Forbes, of his capture of the Luidia—one of the largest British brittle-stars. Having secured a good specimen whole in the dredge, the next step was to introduce it into fresh water, which causes immediate death. Says the Professor:

As it does not generally break up before it is raised above

the surface of the sea, cautiously and anxiously I sunk my bucket (of fresh water) to a level with the dredge's mouth, and proceeded in the most gentle manner possible to introduce Luidia to the purer element. Whether the cold air was too much for him, or the sight of the bucket too terrific, I know not, but in a moment he proceeded to dismember his corporation, and at every mesh of the dredge his fragments were seen escaping. In despair I grasped at the largest, and brought up the extremity of an arm with its terminating eye, the spinous eyelid of which opened and closed with something exceedingly like a wink of derision.

We may now proceed to give an account of the two species of brittle-stars shown in our illustrations and one other common British representative. *Ophiothrix fragilis* is a common species of brittle-star, and should be sought for under stones and other places between tide-marks. As will be observed from Fig. 93, the arms are long, and a good specimen will measure four inches from tip to tip. These arms, however, as has already been shown, break off at the least provocation, and the creature shivers and shatters its body into pieces in a most bewildering manner, with the result that it is then presented after the manner shown in Fig. 92. The colour varies, red, violet, brown, yellow, and grey being forthcoming. The disc is of a different colour from the rays, and the latter are generally banded. The flattened arms bear at their sides bunches of seven, long-notched, glassy spines, and this curious creature also possesses other features of interest which would well repay examination. As this is a common inhabitant of

the sea and seashore, and lives fairly well in confinement, the reader would do well—if he is so minded—to secure a living specimen or two, and make personal investigation into the form and detailed structure of a wonderful marine animal.

*Ophiothrix violacea* is not a British species. The particular specimen figured came from St. Thomas, but it is a near relative of our own brittle-stars, and shows the severance of parts in a characteristic manner.

We need only mention one more kind before passing on—namely, the Daisy brittle-star, or *ophiopholis aculeata.* This is almost as plentiful as the Common brittle-star, and resorts to similar haunts. The spines of the Daisy species, however, are short and stout; the arms are not so fragile nor so long as in the common kind, and these in popular language are the distinguishing features between the two species. There are other detailed characteristics, which are best observed by placing the two animals side by side. Whilst the Star-fishes—as has already been shown—often possess more than five arms, in the members of the ophiuroids (or brittle-stars) this is not so. A number of other species must of necessity be passed by, as also the Sandstars; but the zealous student of marine life is sure to make acquaintance with some of them, and find a congenial occupation in noting the various characteristics and naming the species he has under review.

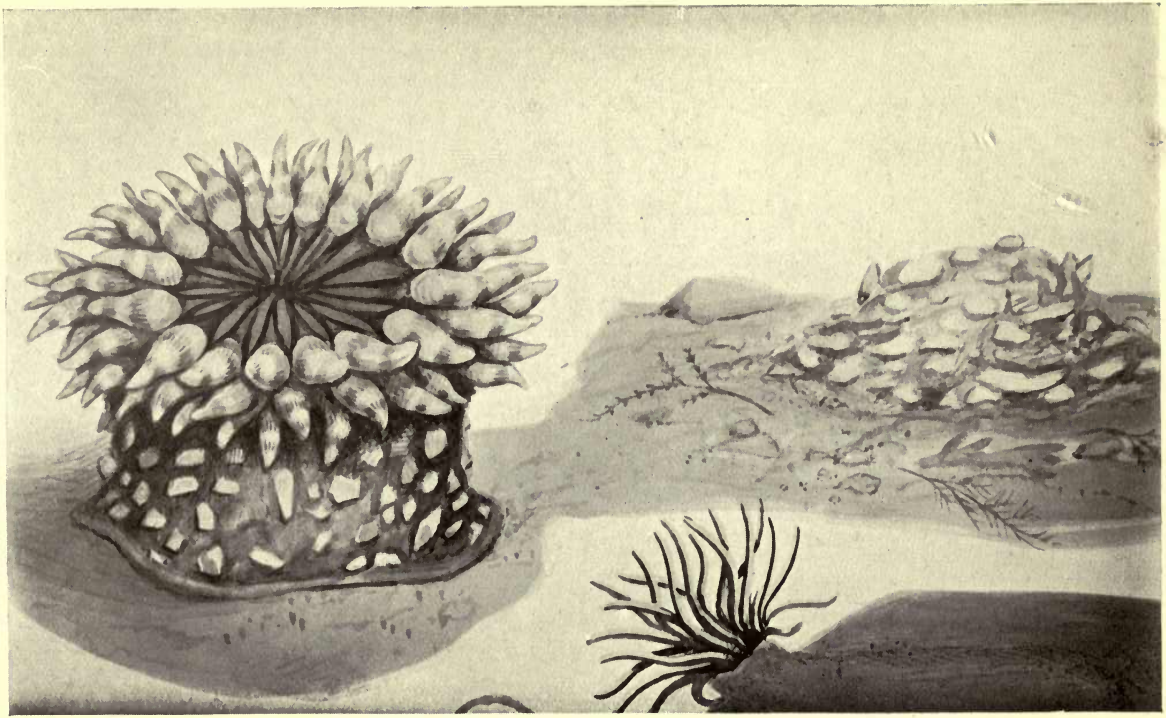


Fig. 97.—(Upper Figure.) THICK-HORNED SEA ANEMONE (*Tealia crassicornis*). (Expanded and Retracted.)
„ 98.—(Lower Figure.) A CASE-BUILDING ANEMONE.

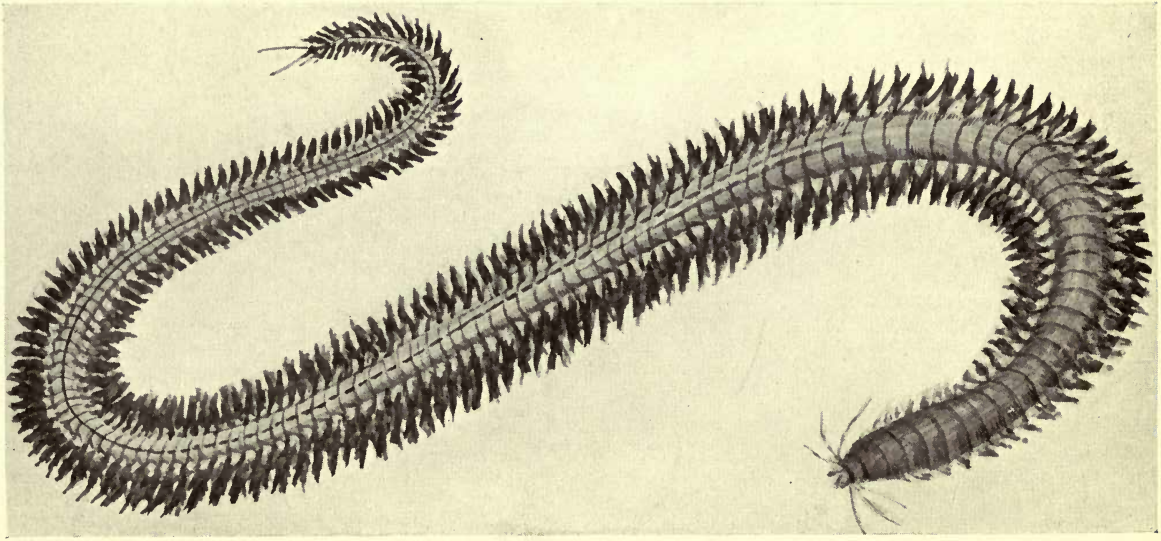


Fig. 99.—Bristle-worm.

Some kinds of Jelly-fish are known by sight to every one who has visited the seashore, but as one sees these extraordinary creatures stranded on the beach, their bodies rapidly being dried up by the action of the air and the sun, one can only feebly comprehend the remarkable story which they have to unfold to us. Much of their life is wrapped in mystery, and we have a great deal to learn respecting them. When I was naturalizing in Filey Bay last autumn, I was intensely interested in examining the large number of jelly-fishes that had been thrown up by the tide. These were large representatives of the Stinging jelly-fish, and some remarkable specimens were cast here, there, and everywhere upon the shore. A good time to secure these creatures is after a strong south-westerly wind has been blowing in the early autumn. Such were the conditions upon the occasion mentioned. I measured several specimens. Two particularly attracted my attention : one was three feet across, and the other three feet six inches! These curious sea-folk swim in shoals ; this accounted for the number cast upon the shore. To say the least, the phenomenon, when viewed for the first time, is decidedly striking. The Stinging jelly-fish is brown in colour, but be careful how you handle the creature. The long yellow threads that are suspended from the body sting very severely, as I have just cause to remember! I believe a good

many persons meet their death when bathing where these Stinging jelly-fishes are found, and that what is often described as 'sudden cramp,' is in reality caused by the bather suddenly coming into contact with one of these large creatures. Even when flattened like a pancake upon the shore, with the threads out of working order, as it were, and the locomotive power stayed, the jelly-fish we are now considering looks a very formidable monster; but when seen floating in the water the bathers may receive quite a fright. I shall not readily forget the 'martyrdom' of the jelly-fishes upon Filey beach. When I returned an hour or two afterwards, I found that the specimens I had recently examined had all but gone, in many instances only a scar remained to show the spot that had been so lately occupied. The body is made up almost exclusively of sea water, and this had evaporated. The air and the August sunshine had done their work, and Nature once more proved herself a wonderfully clean and hygienic mother. It seemed a pity that the sea should have behaved so unkindly to these—its just inhabitants—and left them stranded upon the shore. Yet it is reasonable to suppose that this is one of the means adopted by Nature for reducing their number and preserving the balance between various creatures. In other seas jelly-fishes are found in great numbers and large in size. A friend tells me that when he was on a British battleship, ploughing its way through

the waters of Darvel Bay, near Borneo, the presence of a large number of huge jelly-fishes greatly hampered the ship's progress.

When swimming, the body (umbrella-shaped, as portrayed in Fig. 95) is spread and contracted, and it is an entertaining sight to watch a shoal swimming about together. Even off our own coasts it is no uncommon thing to find the water thickly populated with these oddest of sea creatures.

The fringe of long, slender threads borne by *Aurelia aurita* is well shown in Fig. 95. By means of these threads food is secured, and in a way these are fishing-lines. The food is made up of fish-fry, the young of prawns, shrimps, and other inhabitants of the sea. The Rev. Theodore Wood says in one of his delightful essays: 'If you were to see one of these swim up against those terrible threads, you would notice that it at once became paralysed, and that in a very few moments it would be dead. The fact is that all the way along these threads are set with hundreds and hundreds of tiny oval cells, each of which has a very slender dart, with a barbed tip, coiled up like a watch-spring inside it. And the cells are made in such a way that as soon as they are touched they fly open and the little darts leap out. So you see, if any small creature swims up against the threads, numbers of darts bury themselves in its body, and, as these darts are poisoned, it dies in a very short time.'

No story of the Sea and Seashore would be complete without reference to the wonderful Sea anemones, which doubtless the reader has seen in some aquarium, if not under natural conditions. A pleasant time may be spent watching these curious animals—for such they are, and not plants as is often erroneously supposed—when the tide is coming in and the water is gradually covering them. Then it is that they 'wake up' and expand their tentacles in the manner depicted in Figs. 96, 97, and 98. Further illustrations of various forms of *Actinia mesembryanthemum* are given in the frontispiece to this chapter.

A search among the low-lying rocks along our coast-line should reveal specimens of the Common Smooth anemone. Their beautiful green and yellow colour cannot fail to command admiration. When seen with tentacles expanded, find a whelk or other shell-fish, cut its body into tiny pieces, and give the sea anemone a feed. Placing the small portion of such a tasty tit-bit well within the centre of the anemone's body, you will be rewarded by a wonderful sight as the creature gradually retracts its fishing-organs and sucks in the delicate morsel you have given it. At last the tentacles are all drawn in, and the anemone enjoys its feast. By-and-by it feels hungry again, and as it expands its tentacles the portion of shell-fish from which the juice has been extracted is thrown out. Figs. 97 and

98 give representatives of two kinds of these sea-folk—namely, the Thick-horned sea anemone and the Case-building anemone. Carefully examine the first named. On the left of the picture you will observe a splendid example of *Tealia crassicornis*, with its tentacles expanded; whilst in the extreme right-hand corner you will notice what looks like a little heap of debris upon the shore. This in reality is another of these wonderful anemones, and the specimen figured has retracted its tentacles and contrived to hide its body by collecting pieces of shell, sand, and stones, which closely resemble a little heap of shore debris. Verily these are crafty folk, and for such a low type of animal exhibit remarkable protective powers and devices. In *Tealia crassicornis* the stout, banded tentacles will—as compared with those of the other species figured—at once arrest attention. Next to the Smooth anemone this is our commonest British species. The colour varies a good deal, and the animal also presents structural differences according to the habitat. It may be found clad in various shades of red and green, the tentacles being banded with white, with prominent reddish bands at their bases. Many other varieties are, however, to be met with on various parts of our coast-line where a rocky stratum is present, but care should be exercised when stepping upon slippery rocks, or the enthusiastic anemone-hunter may find a premature grave. When

a favoured pool is found containing a colony of these beautiful creatures a fascinating sight is revealed. The delightful surroundings, the pure, invigorating air, the murmur of the sea, the cries of the sea-birds, the awe-inspiring rocks, the wonderful form and majestic colours of the anemones, all tend to make the experience a remarkable one.

The Common Smooth anemone shown in our frontispiece to this chapter has no particular liking for any given locality, providing there are objects where it can attach its column and a habitat situate between tide-marks. The body is made up of an attached base, an upright column, and a disc which bears a central mouth surrounded by a number of tentacles. These tentacles are of a sticky nature, caused by the ejection of the stinging-cells when the animal is touched. No harm, however, will befall the intruder, for the latter are not strong enough to puncture the skin. The mouth consists of a longitudinal slit, the walls of which are considerably grooved. To give in detail the structural arrangements of an anemone would be wearisome to the reader, but these are the salient features. The mouth opens into a short gullet, and this into the general cavity. When a captive anemone resorts to the curious habit of turning its body partly inside out, this gullet may easily be seen. For further detailed information respecting anatomy I cannot do better than

refer the reader to *British Sea Anemones and Corals* by Gosse, and *Life by the Seashore* by Miss Newbiggin. You will observe in our coloured representation of this species the very smooth column and the short tentacles, as compared with those possessed by *Anemone sulcata*, shown in Fig. 96. These tentacles number about two hundred. In colour the Smooth species is either red, green, or olive-brown. Very often, however, the column is spotted and streaked with lighter colours. This is a good species to keep in an aquarium, and more may be learned from an intelligent watch being kept than from any written description. In captivity it thrives well, makes a charming pet, and when, as often happens, the minute semi-transparent young ones are brought forth almost before one's eyes, vastly interesting and exciting does the vigil become.

The Thick-horned anemone is noticeable because of the size of the base of the body as compared with the column. As a matter of fact, it presents the appearance of a low, flattened species, the surface of the column being covered with warts or papillae, to which shells and stones are attached, as shown in Fig. 97.

With regret we must of necessity leave these most remarkable creatures, but it is hoped that what has been written will induce the young seashore naturalist to make personal observation of these inhabitants of the rocky portions of our coast. He will find his time

fully occupied, and his mind filled with gratitude and wonder.

The last animal with which we are concerned in this portion of our story is shown in Fig. 99, a fine specimen of the Bristle-worm, measuring thirteen inches, procured at Wallasey in Cheshire. The bristle-worms are a very large group of animals, and are divided up into a number of genera, to which attention should be given by the marine zoologist. There are far too many species to be detailed here, nor can we even consider their general characteristics; but we may say briefly with regard to the Nereis that it is a common seaside worm, and when the tide is going out one of these creatures may usually be found under a stone. The colour is often very beautiful, especially when seen in a good light. The life-histories of the many kinds of bristle-worms are of an absorbing character, and there are such a number of species possessing intricate details of form and structure that it is quite beyond our province to deal with them here. We can only commend the study of them to the reader, and can promise him much intelligent and profitable recreation.

## CHAPTER IX

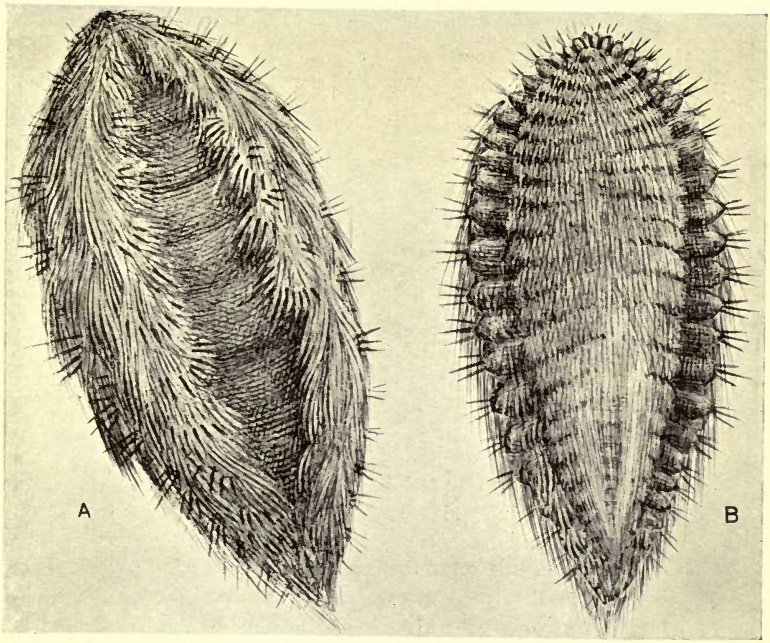
### SEA MOUSE, SEA SLUGS, CORALS, SPONGES, POLYZOA, ZOOPHYTES, ETC.

We now have to consider the life-histories of a number of inhabitants of the opal sea, known neither by sight nor name to the general reader, but vastly interesting notwithstanding. We are fortunate in having before us a series of excellent illustrations which will enable the reader to follow more accurately the written description, and it is very necessary to have pictorial representations of these little-known wonders of the deep.

First on our list is the Sea Mouse, the upper and under sides of which are shown in Figs. 100 and 101 on page 289. This curious animal claims kinship with the bristle-worms, and although the sea mouse does not on first acquaintance bear much resemblance to a 'worm,' it possesses in all essentials of structure similar characteristics to Nereis, which received attention in the concluding portion of the last chapter.

That it is a bristly creature both our illustrations

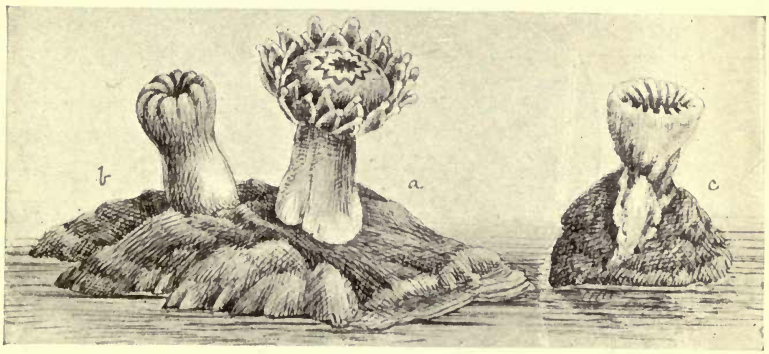
show. It is found along the seashore, thrown up by the tide after a heavy storm, or perchance in a pool close to the water's edge. The body is oval-depressed, and externally very little segmentation is observable. The body is profusely clothed with hairs and bristles, and these combine to form a matted felt and so cover the scales. It is a beautiful creature, the sides of the body giving off brilliant iridescence, which changes according to the rays of light thrown upon them. Among the debris upon the shore the sudden beauty of the sea mouse is bound to arrest attention, the many exquisite hues gleaming brightly and vividly, to the amazement of the seashore naturalist. Ugly in form, but remarkably beautiful in coloration—such is a typical description of this marine creature. It does not attain a greater length than about six inches, but is usually something under the length named. Miss Newbiggin states that 'either because of its beauty, or because it may be practically supposed to be born of the foaming breakers which toss it on to the beach, it is named after the fair goddess who rose from the waves, and is called *Aphrodite aculeata*.' This is a deep-water inhabitant, living in mud or sand. It is preyed upon by various fishes in spite of its bristly exterior. Perchance when found the sea mouse (more like a slug than a mouse, it is true) will not show off its rainbow tints. That is because the mud




Sea Mouse (*Aphrodite aculeata*).

Fig. 100.—(A) Upper (Dorsal) side.

,, 101.—(B) Under (Ventral) side.




British Coral (*Caryophilia smithii*).

Fig. 102.—(A) Expanded.

,, 103.—(B) Closed.

,, 104.—(C) The stony external skeleton.

NUDIBRANCHES, OR SEA SLUGS.
Fig. 105.—(1) DORIS JOHNSTONI.
„ 106.—(2) ANCULA CRISTATA.

Fig. 107.—POLYZOA.

that the bristles have strained out from the water drawn into the gills has coated the creature's body and clogged out its beauty. Then the animal should be washed, not once, but twice and even thrice, and the more it is cleansed of the impurities the more brilliant does the iridescence become, until, at last, one of the most gorgeous animals now living is brought to view.

Of the Nudibranches, or Sea Slugs, we have two representatives in Figs. 105 and 106—namely, *Doris johnstoni* and *Ancula cristata* respectively. The Doris genus contains a large number of members, and includes the true Sea slugs or Sea lemons. *Doris tuberculata* is the largest of our British Dorids, attaining a length of over three inches. The living animal is frequently bright in colour, with blue-green patches upon a yellowish ground. The broad foot is bright yellow. This species should be sought for on the rocks during a low spring-tide. It lays white ribbons of spawn on the rocks.

*Doris johnstoni*, as our illustration shows, possesses prominent gill-plumes and dorsal tentacles. It is nearly the same size as the last named, but is different in shape, and has more numerous gills. The body, it will be noted, is depressed at the side, and is brown on a ground colour of white or yellow. The dorsal tentacles are short and broad.

A very common Sea slug is *Doris bilamellata*. It

occurs on some parts of the rocky coast of Great Britain in incredible numbers, and the rocks are as whitened, if not more so, with these animals as the far-famed Bass is with gannets and other sea birds. It is interesting to notice that, unlike the land slugs of our hedgerows and gardens, Sea slugs are not preyed upon to any extent by sea birds. They pursue their way unhampered, and appear to have very few enemies. The eggs are laid in masses, somewhat after the manner of frog-spawn, and are surrounded with a jelly-like substance such as those of the frog. During the early part of the year these egg-clusters may be sought for on the rocks, and, being laid in the form of spirals, present a very curious appearance, likened by Miss Newbiggin to ladies' frills.

If some spawn be collected, and placed in an aquarium at home, an interesting series of observations at first hand may be made. From each egg a small colourless larva will be seen to emerge, and in a short time the receptacle holding the water will be populated by countless numbers of minute swimming creatures. These baby Sea slugs possess a shell in their infancy, and exhibit swimming powers. The adult does not possess either. If the water be stirred, it will at once be seen that large numbers of the mere but mighty atoms adhere to the sides of the receptacle, and there remain and perish. This simple experiment will enable

the reader to realize how great must be the mortality among these slugs from the continual wash of the sea, so that after all Nature has devised some scheme for reducing their numbers. The species under review measures about an inch in length, and is greyish in colour speckled with brown.

*Ancula cristata* is a common species on some parts of our coast-line during the spring. It is pure white, exquisitely marked and spotted with bright yellow and black. Sometimes, however, this animal is wholly white. We can only mention one more of the many species of Sea slugs which inhabit our shores.

*Dendronotus arborescens* (being so little known by most people, it is impossible to accord English names to a number of sea creatures, and these slugs especially) is a remarkably beautiful kind. Upon its back this species bears a number of branched and fine-coloured processes. It presents the appearance of a bright-coloured piece of seaweed or a flower. The body is red-brown in various shades, marbled and streaked with white in a beautiful manner. It is not a large kind, specimens from the vast recesses of the deep measuring not more than a couple of inches, whilst those found around the shore measure less. It is an active creature, and the yellowish eggs are deposited in the form of a close spiral, the coils being characterized by their narrowness.

The Red Coral of commerce comes from the Mediterranean, where it lives chiefly (yes, it is an animal, and an ally of the sea anemone) at depths of five or six fathoms, although it has been found at 120 or more fathoms. 'Coral' consists of the aggregation of a number of limy cups containing polypes. These latter ingenious little creatures—erroneously called 'coral insects' when they are in no way related to them—suck up lime out of the sea water, and then build it up underneath and around their own bodies. In the Red Coral there are no cups, for the polypes are secreted in a fleshy receptacle, this being done away with when the preparation of the coral is in process. Animals that construct the 'coral' generally known to us do not resort to British seas, mostly inhabiting tropical seas where the water is always warm. Mr. Saville Kent has given us some wonderful glimpses, by means of his camera, of the great barrier reef of Australia, and it must surely be one of the most beautiful Nature sights of the world to visit the remarkable coral reefs situated off the shores of the Antipodes. In our own seas very few species are found, and if success in searching for them is to be obtained, the best time is during a very high spring-tide right at the water's edge. Then perhaps a specimen of the Tuft Coral may be observed attached to a rock in a similar manner to the specimens depicted in Figs. 102 (A), 103 (B), and 104 (C).

Here we have examples of *Caryophilia smithii*, showing it expanded, closed, or retracted, and a view of the stony external skeleton. On occasions, British specimens of the Tuft Coral turn the scale at six or more pounds, but this is as nothing compared with the huge examples obtained from tropical seas. If one of the former be watched, it is possible to observe the small polypes poking out and spreading the minute fleshy feelers, or tentacles. These polypes are a mingling of white, fawn, and chestnut-brown in colour, and the 'coral' that they make is pearly-white flushed with rose-red.

We are getting low down in the scale of animal life now; but whilst Sponges were long considered to be plants, they are, in fact, animals, and constitute a very large and useful class. The bath sponge, known to every one, consists of the skeleton of a colony of one-time living animals. Sponges resort to deep water, and are difficult to reach, yet more than three hundred species are on the British list. The seashore naturalist will, however, have to be content with the examination of a few species only, unless he is fortunate enough to have some specimens dredged up for him by deep-sea fishermen. An examination of a rock-pool should reveal the Bread-crumb sponge or the Grantia sponge. The former is a sort of fleshy crust, and very unlike a sponge as generally understood. It is either yellow or greenish

in colour, and will be found adhering to rocks and stones, or covering the stems of seaweed. When observed in the former habitat it is covered with tiny projections, but when clinging to seaweed it has a quantity of large holes and a smooth surface. The Challina sponge (Fig. 108) is another British species that may perchance be located, and is well deserving of close study. The animals that live within a sponge are all joined together in a homogeneous cluster, and they are so microscopic in size that the eye can distinguish nothing beyond a mass of brownish-looking jelly. They have no power of movement, little feeling, and no active means of defence. Protection is afforded by reason of the skeleton that is formed, and this is made up either of sharp spicules of lime or flint, or of silky fibres. The bath sponge is composed of the latter. Many kinds emit a powerful odour, and are brightly coloured.

'These little creatures,' says the Rev. Theodore Wood, in writing of the Bread-crumb sponge, 'obtain their food in a very curious way. If you look at the surface of the sponge through a magnifying-glass, you will see that it is pierced by a great many very tiny holes as well as by a number of bigger ones. Now, water is always passing in through the small holes and out again through the big ones, and as it does so the little creatures manage to suck out all the tiny atoms

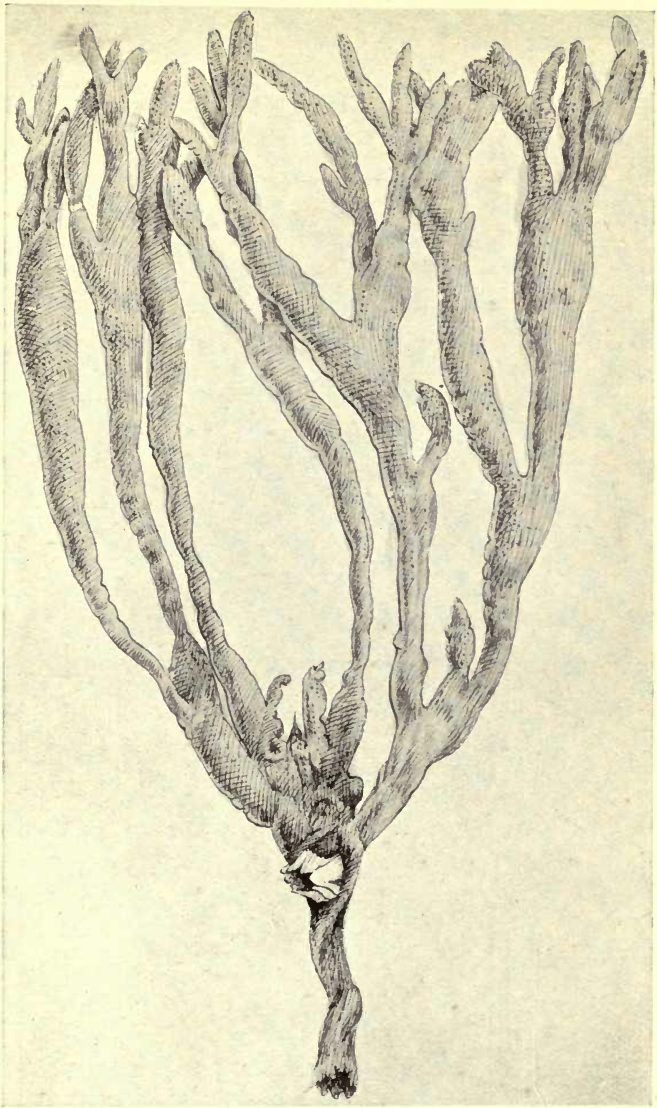


Fig. 108.—Challina Sponge.

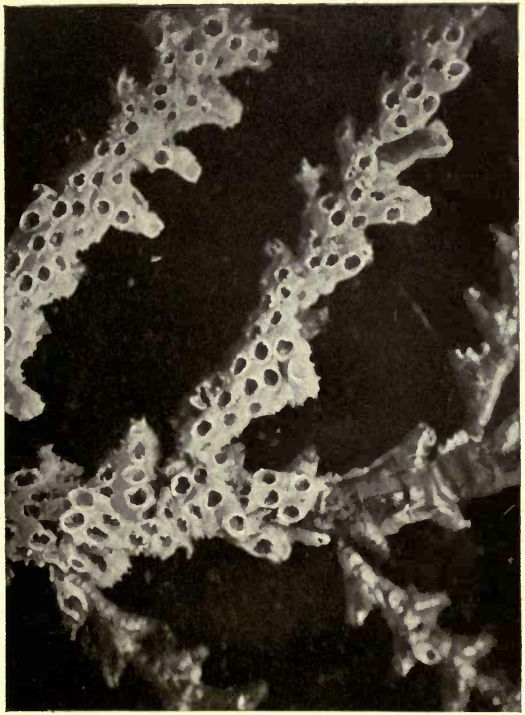


Fig. 109.—Zoophyte (*Lertularia arbie'eria*).

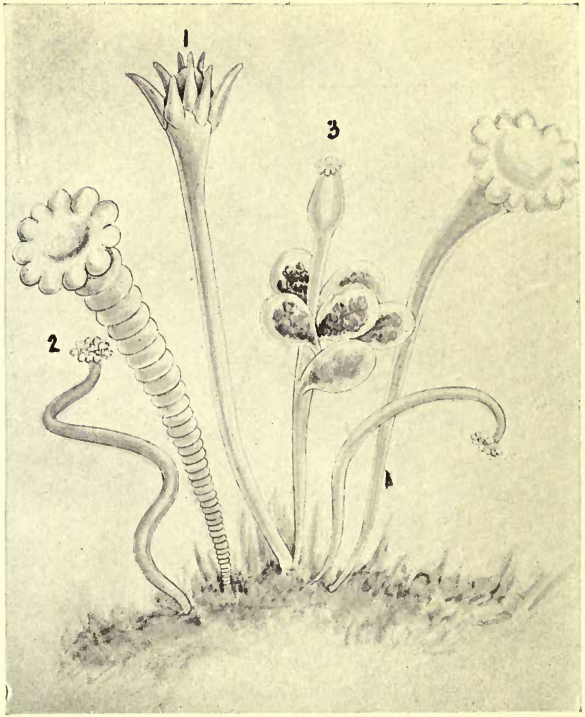



Fig. 110.—Zoophyte (*Hydractinia echinata*).
(Immensely enlarged.)

1. A nutritive person with the tentacles extended.
2. A sensitive person with aborted tentacles.
3. A number of reproductive persons bearing clusters of *Sporosacs*.

of animal and vegetable matter which were floating about in it.' And in this way they live.

Polyzoa, or Sea Mats, as also the compound Sea Squirts, much resemble some kinds of sponges, and care should be taken to distinguish between the three. The two former kinds of animals, however, possess 'polypes,' but the sponges do not. An example of Polyzoa is given in Fig. 107. The Polyzoa is a group of 'worms' that live in colonies, and, as will be seen from our next illustration (Fig. 109), they somewhat resemble the outward appearance of untenanted Zoophytes, which animals are next to be considered. The Sea Mat is our commonest species of Polyzoa, and when found in a dry condition upon the shore is often thought to be seaweed. An examination of an actual specimen is preferable, but our photograph shows that it consists of a number of whitish shells or chambers, each of which once contained a living animal. To observe the latter one should search for them upon the rocks of the seashore, where at least two common kinds may be found; but there are many others. One species forms a soft brownish-coloured encrustation upon the stalks of *Fucus*, and is covered by a number of spines; a second species deftly contrives to spread itself over the broad fronds of *Laminaria*. To acquire any measure of success among these Polyzoa, a microscope or a good magnifying glass is a very necessary

companion. As a result of close companionship with these lowly but wonderful organisms much interest will, I doubt not, be aroused.

This brings us to those remarkable inhabitants of the Sea, known to the marine zoologist as Zoophytes. These low forms of animal life are often erroneously referred to as plants, and sometimes as jelly-fishes! To enter into detail regarding even the general structural characteristics of these wonderful creatures is not necessary in a professedly popular treatise. We are more concerned with their functions than their structure. Figs. 109, 110, and 111 give examples of zoophytes in various forms.

The delicate outlines of *Hydractinia echinata* (Fig. 110) is thoroughly in keeping with the subject illustrated. Some idea may thus be obtained of the real delicacy of these beautiful forms of marine life, more so indeed than in a plain drawing, in which the lines appear hard and formal. The illustration shows the individual persons, or Zooids, in a colony of the species last named. (1) gives a nutritive person with the tentacles extended, (2) displays a sensitive person with aborted tentacles, and (3) exhibits a number of reproductive persons bearing clusters of sporosacs. These are all immensely enlarged. It is not necessary to dilate at length upon the remaining illustrations in this chapter, Figs. 112, 113, and 114. Each figure has a

detailed paragraph underneath, and I wish to devote the rest of this chapter to a lengthy extract from one of the most delightful essays I have ever read concerning these low but lovely forms of animal life. The article treats of American species. It appeared in the March 1908 issue of *Harper's Monthly Magazine*, and is entitled, 'The Spring Awakening of the Sea,' by Mr. Howard J. Shannon. It is so interesting, so informative, so inspiring, upon a subject which is not generally thought to deserve such commendation. Generally regarded as 'nasty stinging jelly-fishes of some kind,' or equally unkind metaphors, these lowly and yet beautiful creatures of the sea are deserving of close study and personal examination.

Mr. Howard J. Shannon writes: 'These plant-like growths are really hydroids, or fixed animal communities. A circulatory fluid flows through all the branches of the stem and through the small flower-like polypes that procure the food for the community with their wreaths of tentacles. Even under the pocket-lens these tentacles show a beaded appearance, but only with a much higher magnification do these crystalline forms disclose themselves as bands of cells that encrust the entire length of the tentacles. Armed with fine threads potent with stinging acids, these weapons enable the polypes to capture and stupefy such microscopic animals as they feed upon. At certain seasons vase-like cases bud out

from the stems and develop within themselves and liberate small creatures that later become jelly-fishes—or medusae, as they are named by science.

. . . . . .

'The fern-like stalk, when dropped into a glass of sea water, slowly subsides and settles upon the bottom with gradually lessening undulations; at first, only small white knobs are visible on the branch ends. Soon, however, the small polypes become reassured, and these knobs extrude fine bundles of glistening filaments, which open upwardly and outwardly until they blossom widely into white corollas of living, sentient flowers. Examined through a pocket magnifying-glass they disclose more detailed beauties. One sees the protrusion of the central mouth, and at intervals the silvery sheen of the petals' swift retraction within their cupped calyx or protective vessel, and then, again, the tentative and cautious emergence and expansion into expectant bloom.

'As I intently watch the stem, a small glistening body, apparently a polype like the others, is seen to be more vigorously and rapidly opening and closing its tentacles, and even impatiently jerking itself to and fro. This peculiar behaviour continues and increases until the frail trembling atom is frantically tossing itself, now against the parent stem, and now in the open water, with strong and convulsive effort. A closer examination shows that the little body is not a polype

or hydranth at all, but a round, transparent disc arrayed with a circle of tentacles, and it is the sharp contractions of these which toss the creature so actively about. Some of the tentacles are seen to be still contained within a small crystal conceptacle, and this unbroken attachment holds the impatient being prisoner. And now, strange to say, the little creature's forceful efforts have entirely freed it from the vessel's rim; but, instead of its sinking, the medusa's intensive expansions and contractions carry it victoriously upward, and, with flashing compressions of its fringing cilia, the disc flutters steadily onward to the water surface and quietly reposes there. Another medusa is seen to be just struggling free from its confinement, and, after a short downward journey, the fluttering bell rises in its onward flight. All about the hydroid stalk I see the glistening, flickering bodies of these almost impalpable creatures as they struggle; while, in the water above them, those that have gained release, a countless company, move steadily along with buoyant and united motion, like a visible cloud of breath in the water—an exhalation of quivering, sentient life that drifts slowly upward and floats away.

. . . . . .

'Although but one-fourth the size of a pin's head, this medusa reveals a beautiful structure under the microscope. About a shallow concave disc, which

supports the central digestive body, radiate sixteen transparent tentacles, the organs of locomotion, capable of very rapid movement. Eight translucent spheres are grouped about the margin of the disc, one upon every alternate tentacle, and within each sphere there is contained a small globule of calcareous structure, which shines with a jewel-like brilliancy. These are the creature's sense-organs, or eyes, capable of guiding its movements probably through their sensitiveness to the light. In some medusae the capacity for hearing or sensing auditory vibrations is also present in guiding organs, while among the Charybdeans the eye is highly developed and shows a retina, vitreous humour, cornea, and lens.

'Upon the sand at the water's edge there lies a particle of jelly-like substance, inconspicuous and almost invisible; but, at this season, one moves in such a world of wonders, the merest atoms of tissue are seen to be informed with such varied and vivid life, that I lift the particle carefully upon a shell and drop it into a jar of water, to see a strange unfoldment, a beautiful transformation. The central mass expands into a double-chambered bell of pure and transparent vesture, and these gossamer globes begin to contract with regular rhythmic motion, lifting the creature upward, and softly urging it forward by their quickly repeated pulsations, while from below four gradually

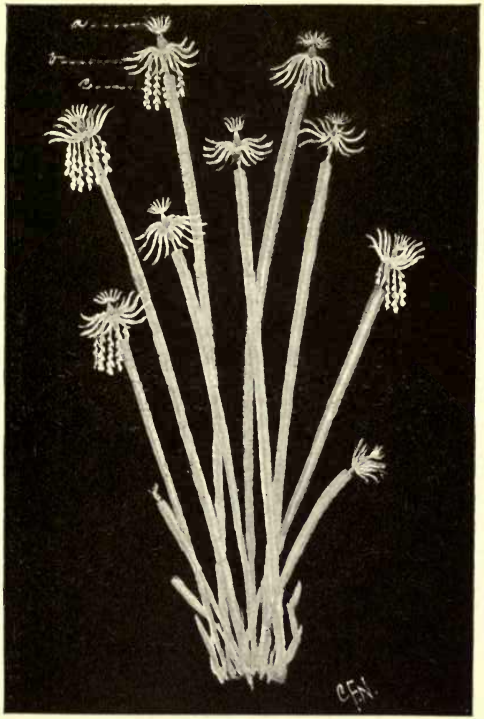


Fig. 111.—ZOOPHYTE (A Colony of *Tubularia indivisa*).

This Zoophyte may be distinguished from any other species by the arrangement of the tentacles, thus (*a*) consists of very short tentacles, which surround the mouth ; (*b*) consists of long tentacles placed below the mouth ; and (*c*) represents the *Sporosacs* borne on branched stalks, and which hang down like small bunches of grapes.

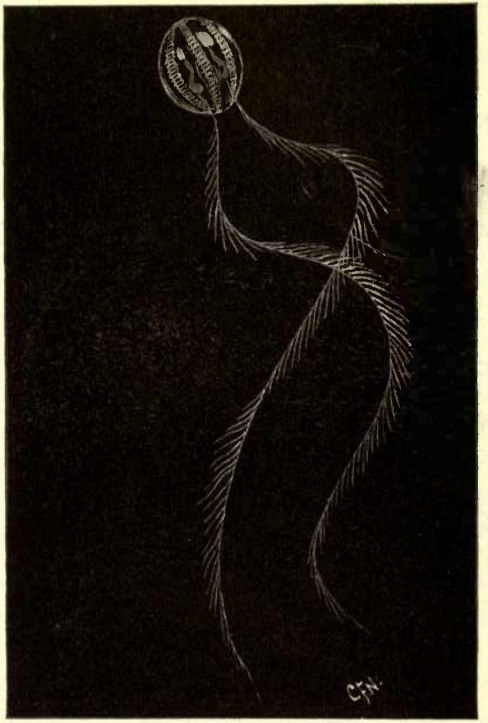


Fig. 112.—BEROE, OR SEA GOOSEBERRY.

A very lovely and graceful animal, almost transparent, and about the size of a small gooseberry. This drawing was made from a specimen Mr. Newall obtained in Anglesey, and placed in a clean glass jar of sea-water. He found that sea anemones devoured them freely, although one would imagine there was little but water for their pains. The movement of the long retractile tentacles is exquisite in its graceful curvature.

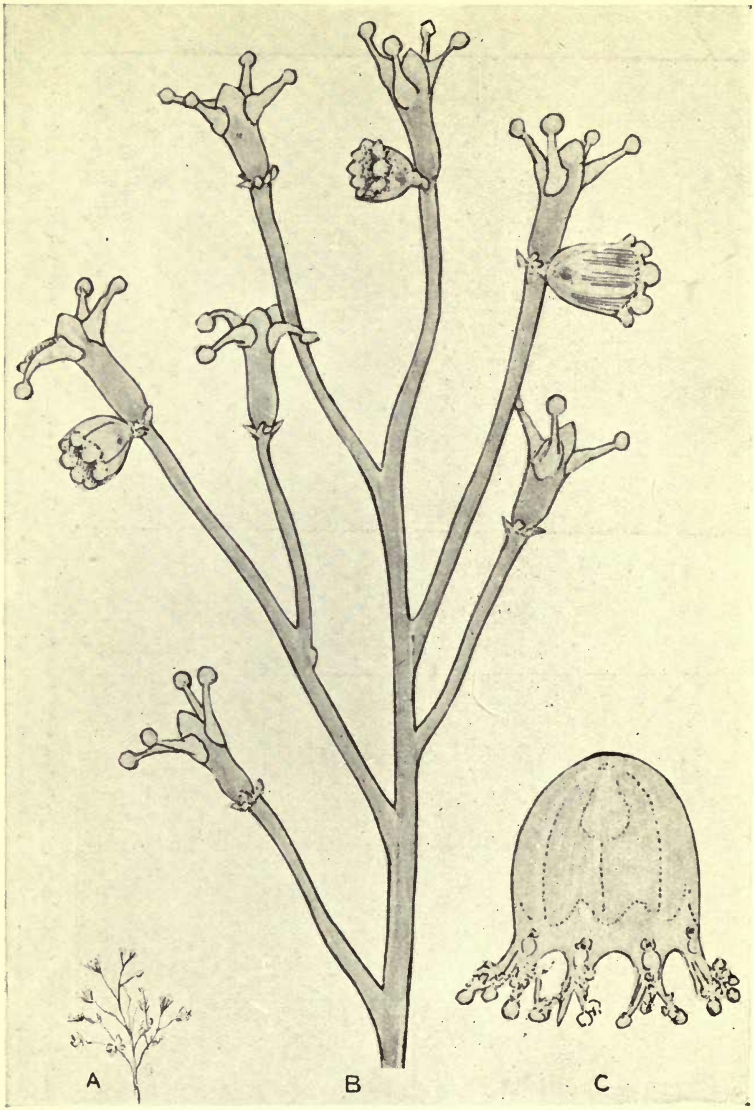



Fig. 113.—Hydrozoa, or Sea Nettle (*Cladonema radiatum*).

(A) The Hydroid Polype with Medusa buds.
(B) The same highly magnified.
(C) Medusa just after liberation.

lengthening tentacles trail backward with graceful undulations. This beautiful medusa, the *Sarsia mirabilis*, is the earliest of our jelly-fishes to appear in spring. . . . One is at a loss to comprehend these creatures, so different in form from any that we are wont to associate with animal life. For although without a head, they are yet capable of sensing the light and auditory vibrations; without hands, arms, or antennae, they are yet responsible to tactile impressions; and although of such fragile and gossamer texture, are yet the vehicle of vivid and intensive life. The movements of the body and the contained impulses that prompt them seem one and indivisible: the desires of its being seem themselves to urge it forward.

. . . . . .

'This spring-time messenger from the sea originates from a rose-coloured hydroid not over an inch high, the *Coryne mirabilis*. This belongs to the tubularian hydroids, which develop their medusae openly upon the stem, and not like the *Obelia*, which forms them within a protective case or calycle. Some of the Tubularians develop medusae which gain no free existence; they wither upon the hydroid after setting free their eggs. These eggs, like those which other medusae, either free or fixed, produce, will develop, after becoming fastened to a rock or timber, into just such a hydroid stalk as the jelly-fish originally grew

from; and this, in its turn, will form other similar medusae, and so complete the strange story of the "alternate generations."

. . . . . .

'Half-globular, opalescent bells, larger than Sarsia, but even less corporeal than they, are descried among the ripples, either floating aimlessly along, just below the surface, or slightly accelerating their progress by soft contractions. Even so, this medusa, the *Halopsis cruciata*, would be almost invisible were it not for the milky opacity of four variously channelled canals that conform to the concave surface of the inner bell, and for the fine fringe of tentacles that depends from the lower margin. Faintly violaceous tints also colour the body tissues, and help to give substance to this gossamer being that seems fitted to rest upon the surface of some placid inland lake, rather than to ride the ponderous surges of the open sea. Now, another larger body approaches, and relies not at all upon the current for its progress, but upon the generous upward reach of its chambered, lobed wings and upon their vigorous downward compressions. Measured and even stately are the creature's pulsations while it moves along, as if already conscious of the dignity which will attend its progress in maturity; for this is the young of the *Cyanea arctica*, which in full development reaches a diameter of seven feet, the largest of all our jelly-fishes.

The vigour that informs the body now is remarkable. Continual expansions and contractions are thrilling through the bell and impelling the creature onward, while the multitudinous down-sweeping tentacles gather in tubular masses underneath the disc, or stream far behind in trailing convolutions, and the quilted draperies that veil the central mouth are also either extending their tissues to sweep the sand with their crenulated skirts, or sensitively withdrawing them far up beneath the throbbing, pulsing dome. During the disc's expansion all its chambered interior is visible, with the ramifying canals that spread a lace-like design over the scalloped lobes, while during its contraction all these forms disappear through the swift down-sweeping compression that propels the creature so vigorously forward.'

We have now surveyed a number of vastly interesting animal inhabitants of the Sea and Seashore, from the huge Whales to the lowly organisms here considered, and it now remains for us to devote attention in our concluding essay to a few representatives of the Vegetable World to be found growing in the sea and in the neighbourhood of the seashore.

## CHAPTER X

### PLANTS AND SHRUBS OF THE SEA AND SEASHORE

Call us not weeds;
We are flowers of the Sea.

When a boy, I used to cast longing eyes at a beautiful collection of seaweeds that had been chastely mounted and framed and adorned one of the rooms in my home. In the centre of the group the words I have quoted at the head of this chapter were prominently inserted, and whenever I think of the plant life of the sea I like to remember those words, in spite of the fact that Seaweeds do not flower after the manner in which that term is generally understood. It is only a childish memory of long ago, but the little text applies with intensified force to-day when there is so much need for the cultivation of a pure and sensible hobby, and so great a responsibility resting upon those who love Nature and her illimitable wonders to encourage and foster a kindred spirit among young people everywhere.

I was much impressed with a sermon preached not

PLATE VIII.

1. Viper's Bugloss.
2. Yellow-horned Poppy.
3. Upright Rest-harrow.
4. Green Laver Seaweed.

p. 310.

long since by the Rev. J. H. Jowett, in which he referred in eloquent terms to this Nature cult, and I make no apology for quoting a few sentences:

'We need a refreshed communion with God's beautiful world. It is a most neglected side of modern education. We have made some advance, but much remains to be done. I would far rather that a child had trained eyes, which were arrested and fascinated with the loveliness of nature, than that her head be crammed with classic lore. I would be content with less learning and have more appreciation, with less knowledge and have more wisdom, with fewer accomplishments and more rare discernment. Next to moral ability, I would have a child trained to see; next to a pure heart, an interpreting eye. All this would mean less of the class-room and more of the garden and the field. I say all this because I am persuaded that the loveliness of Nature is such a powerful minister for the culture of the spirit. "Whatsoever things are lovely, . . . think on these things."'

I want the young people—for whom this book has primarily been written—to regard the Seaweed as 'a flower of the Sea,' and to possess 'an interpreting eye, as Mr. Jowett so aptly puts it. Let us then learn a few facts about some of these Sea plants, and consider the salient features of the plant and tree life of the seashore and its immediate vicinity.

In Figs. 115 (1), 116 (2), 117 (3), 118 (4), 119, and in the frontispiece to this chapter, Fig. 4, we have portrayed six species of Sea plants, to which attention should be directed.

Seaweeds belong to the Algae, which are the simplest green plants, and it is considered that the higher plants have been derived from them. They are adapted for an aquatic life: some are marine, others resort to fresh water. Algae are divided into four large groups, and are named as a result of their general colour.

The Green algae are inhabitants of fresh water, but the Brown algae are almost all of them marine, and, although so called, they exhibit various shades of yellow, brown, or olive, as those who have gathered these plants by the seashore will have observed. It is interesting to notice that these Brown algae are both small and large. Some of them are so minute as to be unobservable excepting through a microscope, whilst others are hundreds of feet long. They are found to be developed to the greatest extent in the arctic and antarctic regions. They retain their position in the ever-murmuring sea by suction-anchors (not roots), and these strong holdfasts and the leathery texture and peculiar structure of the plants enable them to resist the ravages of the ocean. On occasions, however, and in rough weather especially, these flowers of the sea are torn from their moorings and cast upon the shore.

*Fucus nodosus* (Fig. 115 (1)) belongs to the Rock-weed, or Wrack, group of Brown algae, and is found covering the rocks between tide-marks. The Fucus group are ribbon-like forms (see *Fucus versiculus* in Fig. 117 (3)) which fork at the swollen tips and often bear air-bladders, as shown. These assist the plants in floating, and when squeezed with the fingers or trodden upon go off with quite a loud report. The illustration of the Common Bladder-wrack (Fig. 117 (3))—a mere fragment from the ocean's vast bed—shows the forked, branching, reproductive tips and air-bladders. It is from the Rock-weeds, or rather from their ashes, that the chief supply of iodine is obtained. In some districts great masses of this marine vegetation are harvested by farmers to enrich their land after it has been placed in heaps and allowed to partly decay. Another group is known as Red algae, and the reader will doubtless have noticed some of the commoner kinds that so beautifully cover the rocks that are laid bare at low tide. These are mostly marine plants, and are found in various shades of red, dark purple, violet, and reddish-brown, and are often beautifully tinted. Generally, these Red algae are more chaste and delicate than the species belonging to the Brown algae group. Some of them, indeed, resemble mosses of graceful texture.

The Common Bladder-wrack is so called because of the curious little oval bladders filled with air which

are found actually *in* the leaves. When exploring the low-lying rocks exposed when the tide is out, be very careful how you tread, and be sure of your footing, for walking on wet seaweed is a somewhat precarious occupation, and a sudden slip may have distressing results.

Another common Sea plant is known as the Oar-weed. It frequently grows to a height of several feet, but it is difficult of access, as it grows in fairly deep water, and is not to be seen even at low tide. Specimens may, however, be picked up among the debris on the shore after a storm, wrenched from the ocean's bed. The long, thick stem and the flat leaves will at once arrest attention. If the specimen is fresh the stem will be found to be somewhat soft, and can be cut with a knife; but if it be allowed to dry it becomes, in course of time, so hard that it is used for the purpose of making knife-handles! An examination of the so-called roots of this, or any other Seaweed, will reveal the fact that these marine plants do not possess a root as plants in general do, but a sort of powerful sucker, by means of which they attach themselves to rocks and other places.

To the two other species of Seaweed shown in Figs. 116 (2) and 118 (4), attention need only be directed. Neither possesses an English name so far as I can ascertain but *Bryopsis plumosa* will at once attract

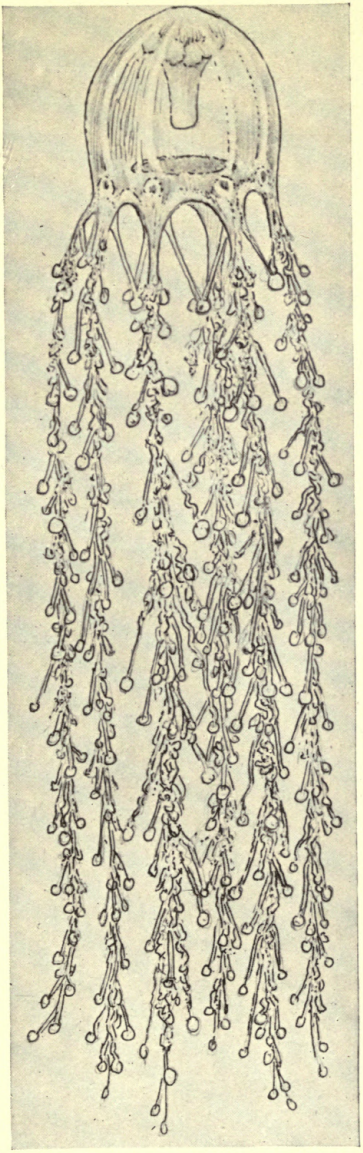


Fig. 114.—Hydrozoa, or Sea Nettle (*Cladonema radiatum*).

Showing Medusa after liberation from tree.

SEAWEEDS.

Fig. 115.—(1) FUCUS NODOSUS.
„ 116.—(2) BRYOPSIS PLUMOSA.
„ 117.—(3) COMMON BLADDER-WRACK (*Fucus versiculosus*).
„ 118.—(4) HALIDRYS SILIQUOSA.

attention, by reason of its delicate form as compared with some of the coarser and ranker seaweeds, and *Halidrys siliquosa* cannot fail to catch the eye because of the curious spiral growths shown on either side of the stem.

In Fig. 119 we have a representation of the Calcareous seaweed. This species has special interest for botanists and students of marine life. It was long subjected to keen examination and research. Was it a plant, or an animal, or a kind of coral? It is now recognized as a plant, and the reason of the curious phenomenon is thus explained. It has the power of sucking out lime from the sea water in which it makes its home, and of building this up round itself somewhat after the manner of the Corals described in our last chapter. After the plant has changed its general appearance by this limy encrustation, it eventually dies and leaves behind a sort of chalky skeleton as a memento of its former self. If the 'skeleton' is dissolved by means of acid, the vegetable portion—or what is left of it—is found underneath. The plant itself is deep purple. It is a dwarf species, and does not attain a greater height than a few inches. Search should be made for it on the rocks when the tide is well out. Here it will be found in abundance.

The Green Laver seaweed (see Plate VIII., Fig. 4) and the Purple Laver are both common marine plants found in quantities on most parts of our rock-girt coast.

They are also known as Sea lettuce, from their broad, bright green leaves. To those who have a marine aquarium these plants may be highly commended. The broad leaves secure a plentiful supply of oxygen, which purifies the water, to the great benefit of the various inhabitants of the aquarium. The leaves give off freely little bubbles of oxygen, and when the sunlight plays upon them they present a very bright and animated effect. Both the Green and the Purple Lavers are used for food, being boiled down into a sort of pulp or jelly.

Another very common Seaweed where rocks abound is the Dulse, also known as the Dillosk, or Dillisk. It does not restrict its habitat to rocks, acting the part of a plant parasite by growing upon other kinds of seaweed. It is a deep, dark red, which is seen to perfection in a clear pool, when the leaves throw up a number of beautiful colours difficult to describe. This species of seaweed is also used for the purposes of food, and it is not only eaten when cooked, but also in its natural condition.

An ill-named sea plant, Carrageen Moss, may next claim our attention. It is not in the least moss-like in general appearance. The colour varies from green to yellow and purple. Here again we have an edible sea plant, for its leaves are boiled down to a kind of jelly. The 'size' obtained from it is utilized in the

process of manufacturing calico. As the Rev. Theodore Wood points out, farmers use it for the purpose of fattening their calves, and also for mincing with the meal or potatoes for feeding pigs. Regarded from all these points of view we have, in the curious named Carrageen Moss, a most useful sea plant.

If you search in the pools that are left by the receding tide you may find a very pretty kind of sea-weed with long, narrow fronds known as the Sea Grass. As you gaze into the little pool and see the fronds waving hither and thither in the water a very beautiful sight will be displayed to view. It is one of the most exquisite in the whole fairyland of living things. These fronds, it will be observed on examination, are not all of the same width, some being distinctly minute and hair-like, whilst others resemble pieces of narrow ribbon.

Another marine plant that may come under the notice of the seashore botanist is the Grass Wrack. Strictly speaking, this is not a species of seaweed. The latter are flowerless plants, whilst this is a flowering plant, and is thus at once distinguished from its fellows. It resorts to the bed of the ocean, and has very narrow and long leaves, bright green in colour. On first acquaintance one is struck with its grass-like character, the narrow leaves often measuring from thirty-six to forty-eight inches.

The flowers are borne in a sort of sheath which is formed by one of the shorter leaves. The stem of this plant has the habit of creeping along the bed of the sea, where it is muddy and sandy, and throwing up leaves here and there. It is a most prolific species, and when the tide is well out whole areas of the floor of the ocean may be found populated by this true flower of the sea. Among the hordes of plants various small marine creatures hold high revel, and this proves a happy hunting-ground for many kinds of tiny sea-folk who seek shelter and seclusion among the Grass Wrack colonies. The sea casts upon the shore large masses of this plant, of which people are not slow to take ample toll. The long, narrow leaves, after being well dried, are frequently utilized for the purpose of packing breakable articles, and thus take the place of hay and straw. Truly in many, many ways do we reap a rich harvest from the wonderful and mysterious sea, both in the animal and vegetable worlds.

The last aquatic plants with which we are concerned are the wonderful Diatoms. These are microscopic plants that inhabit both fresh and salt water, but it is only as a result of examination through a high-power microscope that their real beauty and structure are revealed. Three excellent illustrations (Figs. 120, 121, and 122) will give the reader some conception of what these tiny vegetable growths are like both in their natural

Fig. 119.—Calcareous Seaweed.

Fig. 120.—Diatoms on Coralline in Situ.

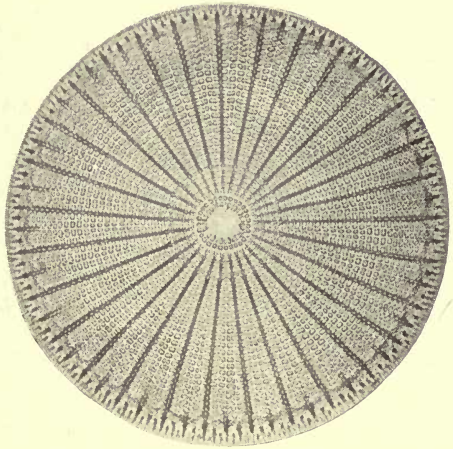


Fig. 121.—Diatom (*Arachnoidiscus ehrenbergii*).

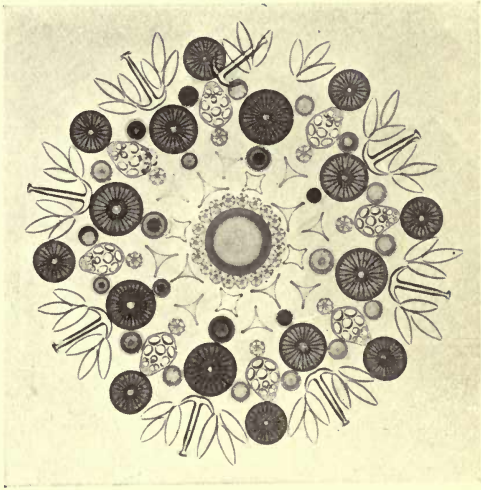


Fig. 122.—Group of Diatoms, with a few Crowns and Anchors.

position and as examined through a glass. Generally, these Diatoms are yellowish-brown in colour, and they possess powers of locomotion. This is probably brought about by means of what is called ciliary action. The cilia consist of very fine lashes. They can only be seen under a powerful microscope. These remarkable plants used to be placed, like the Coralline, in the animal kingdom on account of their powers of movement; but, as a result of careful study, it is now acknowledged that they should be classified among the lower forms of algae, several members of which we have already treated of in this chapter. Mr. Richard Kerr, in his book *Nature Through Microscope and Camera*, says that 'they consist of a single cell, free or adhering in chains or planes. A coat of silica invests the plant. This coat is composed of two valves, generally alike, joined together by connecting girdles. It is the opinion of some authorities that the flinty structures are skeletons arranged in symmetrical halves and joined at their margins by an intermediate rim or hoop. The valves are of various forms, and their surfaces exhibit delicate markings. Many of these united valves, or skeletons, are not unlike pill-boxes, each with a lid, bottom, and rim. Some are oblong, others sigmoid, elliptical, triangular, &c. Diatoms increase in number by successive division into two, in such a manner that succeeding generations are diminished in size. This diminution

is owing to the fact that the wall of the older portion overlaps that of the younger, and the diminution therefore corresponds in extent with the thickness of the wall. This process goes on through a series of generations, the minimum size being about half the maximum. When the minimum is reached the wall is cast off, the contents become rounded in form and increase in size, and a new individual of the maximum size is produced.'

'The late Professor W. Smith estimated that no less than a thousand million individuals may be produced by division from a single plant in one month!

'Vast numbers of these organisms are peculiar to the open sea, and they possess a sufficient degree of buoyancy to enable them to live and to move amongst its waters without the aid of any supporting body whatever.

'Their buoyancy and power of movement are entirely independent of the ordinary to-and-fro motile power shared by them, in a greater or less degree, with all the other free forms of Diatomaceae.

'According to Ehrenberg, the Diatoms have exercised an important influence in blocking up harbours and diminishing the depths of channels. A mud deposit, consisting, chiefly, of their siliceous valves, no less than 400 miles long by 120 miles broad, was found at a depth of between 200 and 400 feet on the flanks of

Victoria Land in 70° south latitude. Deposits of Diatoms are found in tertiary and post-tertiary strata. The Bergmehl of Norway is composed of fresh-water species. Small deposits have been found underlying beds of peat in Great Britain and Ireland. A bed twenty-five feet in thickness, composed entirely of marine species, and extending over a large area, occurs at Richmond, in Virginia. Similar beds exist in other countries.

'No mind, however mathematical, can have any conception of the numerical strength of these lowly yet magnificent organisms. In the Botanical Department of the Natural History Museum in London, a block not more than two cubic feet in measurement is preserved in a glass case. It contains not fewer than twelve billion (12,000,000,000,000) individual plants! This block, representing so much life, could be carried under the arm with ease.

'Figures fail to help us when we try to form an idea of the life represented in the deposit in the Antarctic Ocean, 48,000 miles in area, or in the fossil deposit of Virginia. With regard to this almost cubical block, the contents of the cells and the whole tissue of the plants have gone except the siliceous coats. The mass is from a fresh-water lake in Australia. Year after year the Diatoms in myriads lived for a short time in the water; when dead, the organic portions decayed, and the remaining imperishable siliceous coats fell to

the bottom of the lake, and gradually formed the pure deposit of which this is a fragment.

'As regards the longevity of Diatoms,' the Rev. F. Wolle (*Diatomaceae of North America*) says that 'dried specimens cannot be revived, but they have been known to survive nearly a quarter of a century in their natural element, even though kept for long periods in the dark, and at times frozen in solid ice. Their siliceous covering is almost indestructible through very high degrees of heat.'

'Specimens for mounting can readily be collected in a wide-mouth bottle, with some fine muslin to act as a net. When the Diatoms are attached to the stems of other plants under water, it is best to remove the stem with its specimens (as shown in Fig. 120). Very frequently, however, they are only entangled in the meshes of confervae, and can be obtained by the usual ring net employed by microscopists.

'The surface mud of ponds generally contains large supplies of beautiful representatives of this remarkable family. To separate them from the sand, the contents of the bottles should be placed in distilled water and allowed to remain for a time, when the sand will collect at the bottom, and the Diatoms may be skimmed off.

'A few words more as to the markings which the surfaces of the Diatoms exhibit. Some are arranged in lines, parallel or radiating, or assume the outline of

the individual specimen. Some markings appear as dots, others as if crossing each other.

'Many naturalists believe that the markings are depressions, but as different effects may be obtained by different methods of illumination, the question of hemispherical elevations, or cup-like sculpturings, is by no means settled. These tiny objects, although so small that many of them are on the borders of our vision, or even below unassisted sight, are decorated with thousands of lines and markings in fixed, definite, symmetrical order, each kind of Diatom having its own special markings characteristic of its group. Very high powers of the microscope reveal not only surface or primary patterns, but also secondary or even tertiary markings. Mr. E. M. Nelson, who is deservedly looked upon as an authority on the study of these wonderful products of Nature, admits that even with the highest microscopical powers he is not able to exhaust or reach the limits of design in a Diatom! Complex designs involving the symmetrical arrangement of many thousands of lines and dots on a speck of flint that is too small to be seen without a microscope! The seven artificially constructed wonders of the world, whatever they may be, are not to be compared with these marvels of regularity and exquisite beauty.'

It is only by detailed information regarding these microscopic plants that any idea can be ascertained of

their extraordinary character. I make no apology, therefore, in quoting the following further remarkable passages from the same author's *Hidden Beauties of Nature*. Mr. Kerr writes:

'The microscope enables the geologist to study the rocks of the globe, so that he can show that whole districts of Istria and Dalmatia consist of Diatoms; that these flinty boxes contribute largely to the composition of the rocks of a recent geological formation; that lake deposits several feet in thickness exist in Australia; that the soil of large tracts in Austria, near Bori, is almost exclusively flinty boxes of Diatoms; that the city of Richmond, in the United States, is built upon an eighteen-feet stratum of fossil Diatoms. The seas and fresh waters of the globe contain countless millions of diatoms—they are to be found in every country in the world. The hoardings of our cities advertise in large characters myriads of Diatoms for sale, only substituting for their correct name the words "knife polish." Many a man has more Diatoms in his scullery than he can examine and mount as microscopic objects, even if he should devote a lifetime to the task.

'England has become possessed of other countries in various ways and by a variety of means, but none of her actions were so subtle as those now employed in acquiring South America, for we are daily purchasing, in shilling and sixpenny packages, the soil of the pear-

shaped continent. Ostensibly we use it above board (i.e. the knife-board) as knife polish; but we are keeping it to augment our soil, and it is only a question of time to see it all conveyed to our shores. The men who make the microscopic study of Diatoms their hobby are rudely termed "Diatomaniacs." Yet there are few studies more fascinating, or that so well repay any trouble expended upon their individual examination. Some of the greatest naturalists in England, America, France, and Germany are skilled diatomists. Although these tiny plates are so insignificant apparently, yet large volumes have been written about them, and the highest art has been brought to bear upon the illustrations which are used to make their study easy and attractive. But no illustration and no word-painting can at all compare with a five minutes' peep through a powerful microscope, when a group of Diatoms is in view.'

Mr. Kerr thinks it more possible to come face to face with infinity in the great outer space, represented in astronomy, than 'to form any conception of infinity as regards the minute side of creation. Few objects bring home to us more effectively the limits of imaginative power than do the Diatoms.'

We may now proceed to consider a few of the characteristic shrubs and plants found growing on, and in the neighbourhood of, the seashore, and with these our story will come to a conclusion. We will deal

firstly with the coloured representations displayed on the frontispiece to this chapter—namely, the Viper's Bugloss, Yellow-horned Poppy, and Upright Rest-harrow. The Viper's Bugloss is a really beautiful plant; I do not know any other British wild flower that possesses such a wonderful combination of blue, red, and purple blossom. This is enhanced by the plant's habit of growing in an upright position, attaining to a height of, it is said, three feet. I have never found it so high, and it seems to me that an average height would be from twelve to eighteen inches. The flowers are borne in short cymes, and the plant presents a charming appearance when some of the blossoms are unopened, for whereas the corollas of the latter are purplish-red, the flowers when fully opened are a bright blue. The contrast is very effective. The whole plant is of a rough, hairy character, and depends upon insects for fertilization. When the stamens (the male organs) burst their pollen sacs, or anthers, the short pistils (the female organs) in the same plant are found to be unready to receive the precious pollen upon their stigmas. Thus the plant cannot be fertilized by its own pollen, and entirely depends on the visits of insects that have taken toll from other plants and become, as a result, dusted on their under surface with the pollen. In due course the pistil lengthens, and its stigmas then assume such a position that insects visiting the plant are bound

to come in contact with them. Thus fertilization is effected. In my *Story of Insect Life* I dealt somewhat fully with the pollination and fertilization of plants by insects, and the reader would do well—if he is interested—to pursue this subject further by referring to that book.

The Bugloss grows on chalky or gravelly soils, and flowers from June to August. It secretes an abundance of honey, and is thus visited very largely by insects, and, as has been shown, their pilgrimage to the rich storehouse is of great service to the plant. Much difference of opinion prevails regarding the derivation of the name Viper's Bugloss. The Latin name *Echium* is derived from the Greek *Echis*, a viper, and Bugloss comes from the Greek *Bous*, an ox, and *glossa*, a tongue. This name is given because the leaves are rough like the tongue of an ox, but what connexion the plant has with the viper has never been satisfactorily explained.

On shingly beaches and sandy seashores the very handsome Yellow-horned Poppy cannot fail to attract attention. The beautiful, pure yellow flowers, the curious horned seed-vessel, the leathery blue-green leaves, and the arid habitat of the plant are all salient features. It may be found in flower from June to October, but the petals, in a similar manner to the better-known scarlet poppy of our cornfields, soon fall after they have attained maturity. It claims kinship

with the *Papaveraceae*, or Poppy family, but is placed in a different genus, *Glaucium*, and is the only British species we possess.

The pungent aroma of the Rest-harrow is sure to attract the notice of those visiting the seashore whose olfactory organs are of a delicate nature. There is more than one species, but our artist has figured for us the Upright Rest-harrow (*Ononis arvensis*). I have found this plant exceedingly plentiful on many parts of our coast, and particularly so at Cromer, in Norfolk, better known as 'Poppyland.' Generally these are creeping plants, although the present species grows upright. The plant takes its popular name because its root stock is able to *wrest* that useful agricultural implement, the harrow, from its work.

*Ononis repens* exhibits a prostrate habit and is hairy, but *Ononis arvensis* is spiny, and is indeed a sub-species of *Ononis spinosa*. The scientific name *Ononis* is derived from *onos*, an ass, this animal, so it is said, having a liking for it. The pink-and-red flowers are in form like those of the garden pea and bean. It belongs to the order Leguminosae. It blossoms from June to September, and appears to depend very largely upon insects for fertilization, in spite of the fact that it does not secrete honey. Pollen, however, is obtained by bees as a result of the service rendered.

We now come to Figs. 125 (1), 126 (2), 127 (3), and

Fig. 123.—The Ever-murmuring Sea.

Fig. 124.—A Wave Study on a Rocky Coast.

Fig. 125.—(1) Sea Buckthorn.
„ 126.—(2) Samphire.
„ 127.—(3) Tamarisk.
„ 128.—(4) Ragwort.

128 (4) in our last plate—namely, the Sea Buckthorn, Samphire, Tamarisk, and Ragwort.

The Sea Buckthorn will be found growing well and flourishing exceedingly by the sea, although openly exposed to the strong winds that prevail. It is a shining, silvery, willow-like, dioecious shrub, with alternate leaves as shown in Fig. 125 (1). The male flowers grow in axillary clusters, whilst the female flowers are solitary. The orange-yellow fruit is globose, or oblong, grooved on one side. The shrub attains a height of at least ten feet, and may be looked for in the neighbourhood of sandy seashores from York to Kent and Sussex. It is not a common species, and is the only member of its genus, *Hippophae*, upon the British list.

The Samphire belongs to that intricate order of plants known to botanists as the Umbelliferae. It thus claims kinship with the Hedge Parsley, the Pignut, and the Cow Parsnip of our lanes and meadows. It is a fleshy, glabrous, much-branched herb, woody at the base. The compound umbels bear many rays, and it has small white flowers. It grows on maritime rocks from Ayr southward, and also occurs in Ireland and the Channel Isles. The flowering period is from June to August, the height of the plant from six to ten inches. The leaflets, as our drawing shows, are linear-shape and fleshy.

Those who have visited Eastbourne will have noticed the beautiful terraces of tamarisk which flourish so well at this favourite seaside resort. From this shrub manna and galls are obtained, and its ashes yield soda. It abounds on the banks of the Tamaris river in Spain, hence its generic name of Tamarix. It is an evergreen, and attains a height of from five to ten feet. The leaves, as will be seen from Fig. 127 (3), are minute, and the branchlets are very slender and feathery. The flowers are either white or pink, and are borne in catkin-like obtuse spikes measuring about one inch in length. The fruit is a capsule. It flowers from July until late autumn, and is much planted because of its hardy character, the shrub withstanding with success cold, cutting, salt winds. This is an introduced species, but has flourished so well, and for such a long time, in our country, that it is now regarded as indigenous.

The Ragwort grows in abundance on many parts of our coast, and its large heads of golden blossoms present a most beautiful sight. On the Lincolnshire coast I have observed this plant growing in profusion, and a search among the leaves in the autumn is bound to reveal the striking orange-and-black larva of the cinnabar moth which feeds upon the leaves. This plant belongs to the same order as the Common Groundsel—namely, the Compositae—but is a much taller,

larger, and more handsome species, the bright yellow or golden flower-heads measuring about one inch across. There are several species, but these need not be detailed. The inflorescence is known as a corymb. The leaf is much cut up into toothed lobes, the upper ones without stalks. The flowering season is from June to October, and although a more typical habitat is poor, uncultivated ground inland—let it be ever so stony and barren—it is to be found flourishing on sandhills and elsewhere in the neighbourhood of the sea, and is justly entitled to a place in our story.

We must pass by a large number of plants and trees that grow by the Sea and Seashore, some prominent, others only to be found after careful search; but in conclusion may describe the salient characteristics of the beautiful Sea Holly. This plant belongs to the Umbelliferae like the samphire, and it is interesting to notice that whereas all our British species of this order bear flowers either white or yellow in colour, the Sea Holly is the sole exception, its flower being pale blue, borne in very dense bracteolate heads. It grows to a height of from one to two feet, but the perennial rootstock is of a creeping disposition. The whole plant is of a glaucous hue, a salient feature in regard to a number of species of plants that is bound to impress itself upon the young botanist who explores the flora of our coast-line. The rigid, tough, and spiny leaves

—hence the name of Holly—are sure to attract notice, as also the bracts beneath the flower-heads. It blossoms in July and August, and is common on our sandy shores. The plant was greatly esteemed medicinally in the so-called good old days, and candied as a sweetmeat.

Here we take leave of the reader, having surveyed the commoner forms of animal and vegetable life to be observed in the Sea and upon the Seashore, and trust that interesting information may have been given upon a subject that has not received the attention it richly deserves.

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